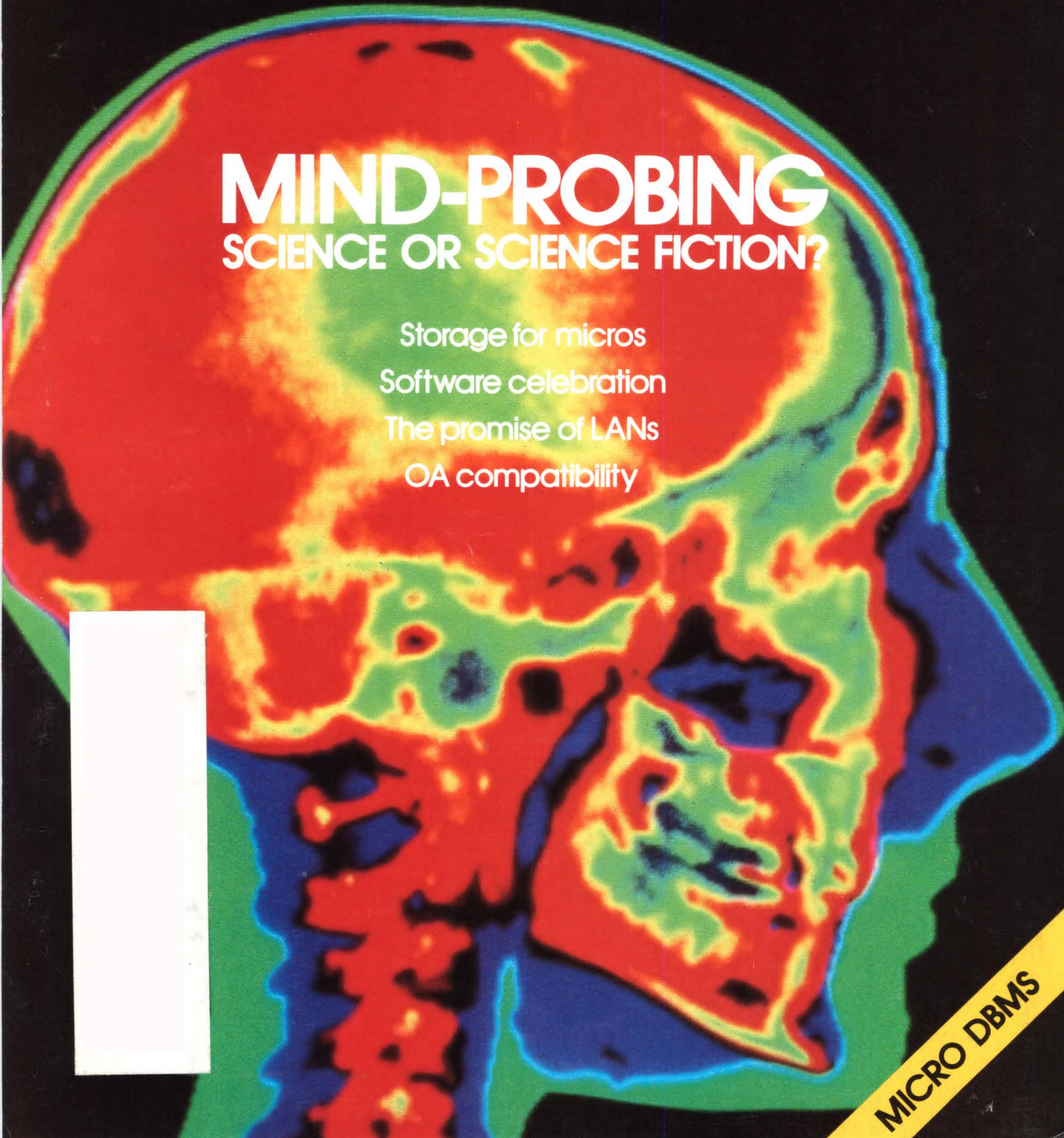


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APRIL 1984

THE MANAGEMENT MAGAZINE OF COMPUTING

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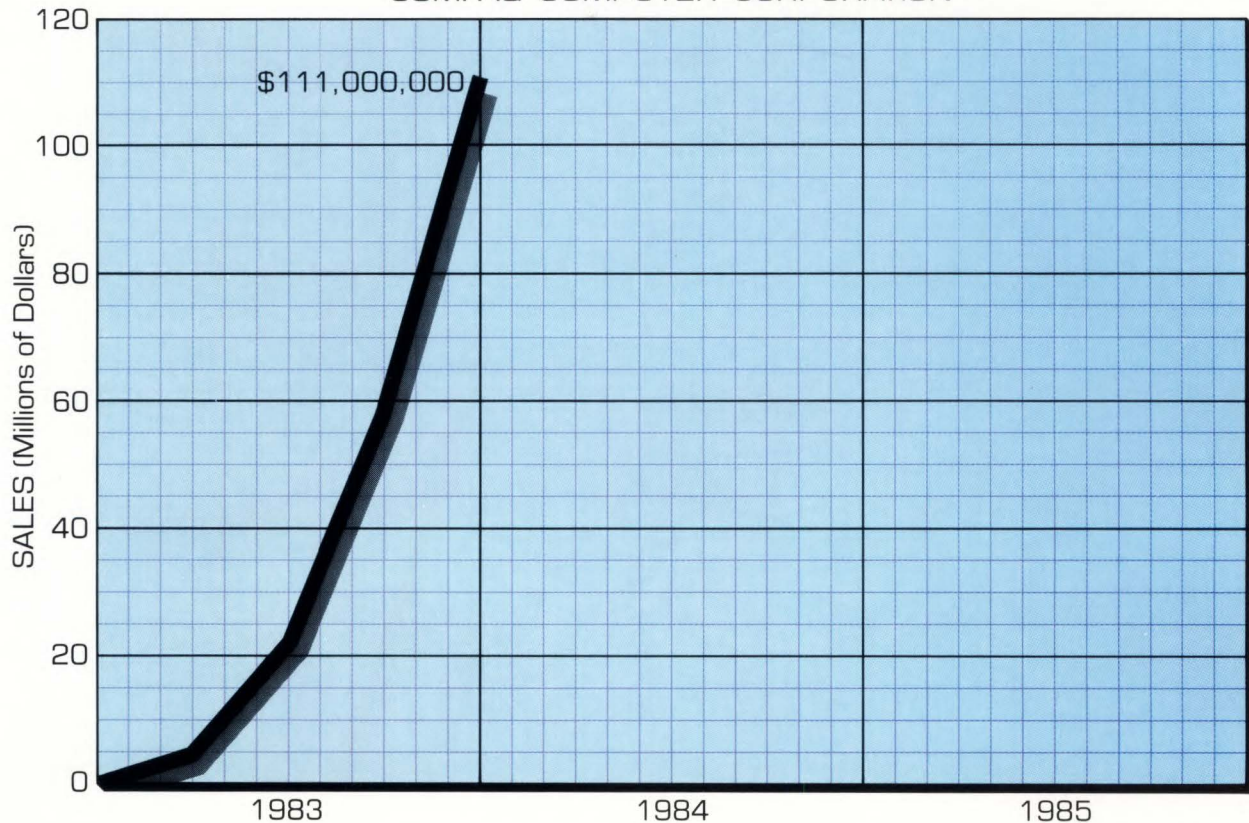
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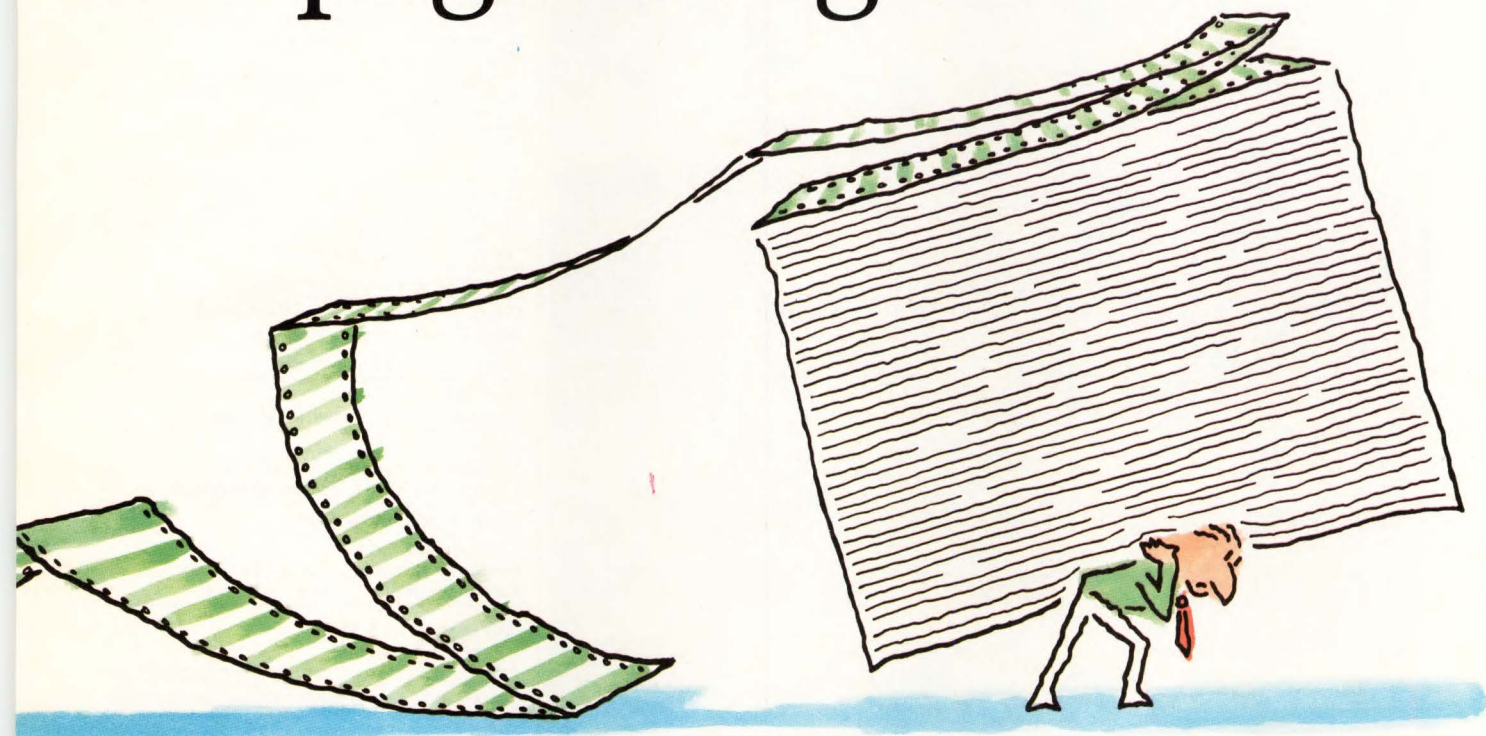
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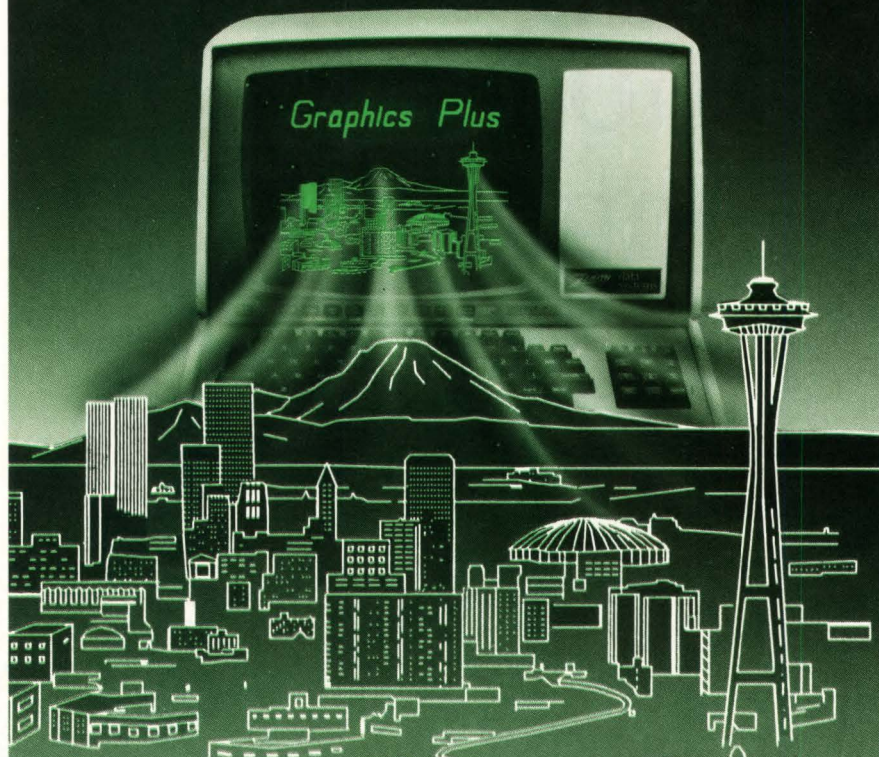
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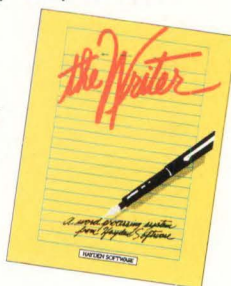
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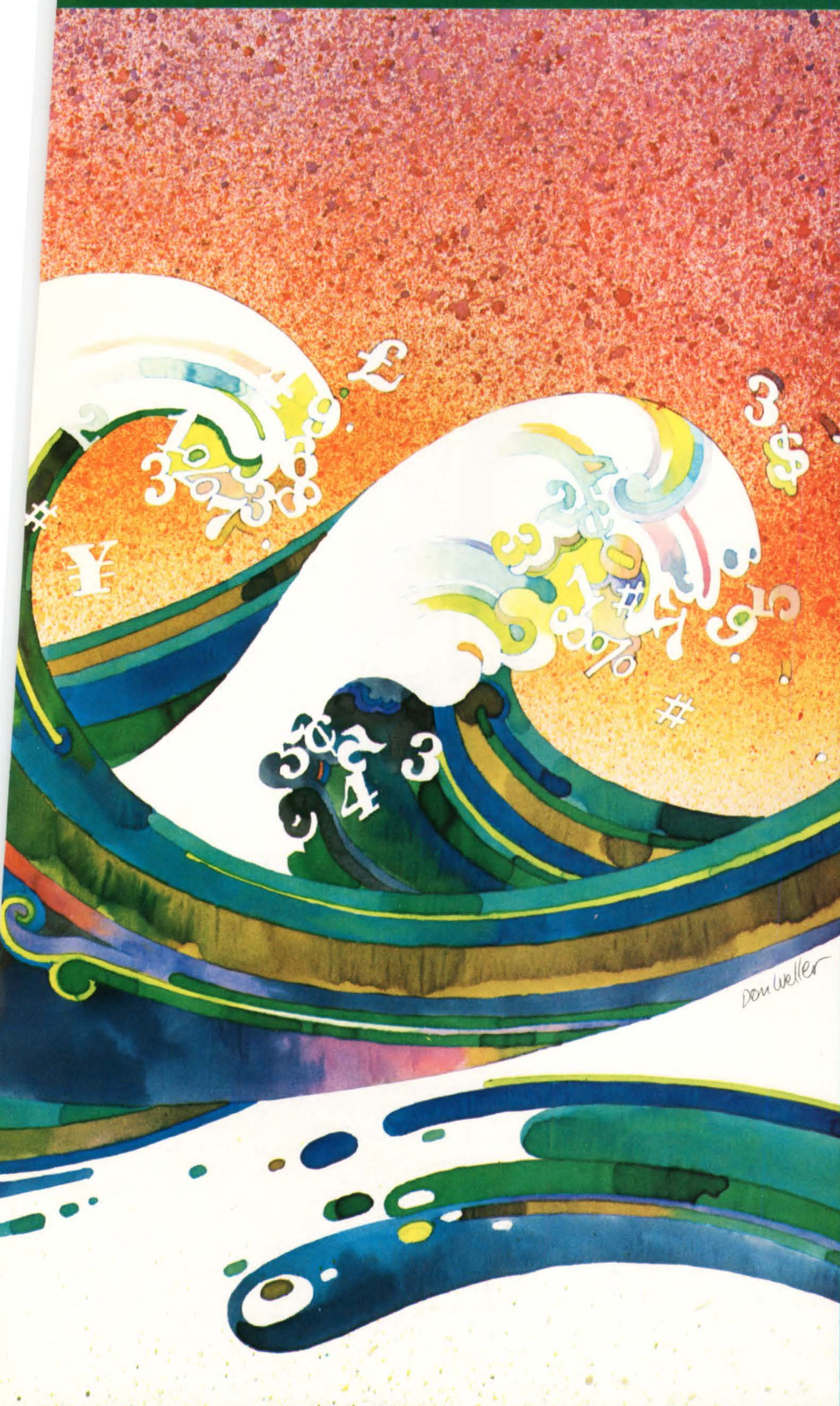
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INSIGHT

C'mon, teletext

Have you ever arrived at the airport only to discover that the flight you planned to take is delayed by hours or, worse, canceled? (Calling the airline beforehand is often an exercise in futility; if the phone line isn't busy, a recorded message is likely to tell you all flights are arriving and departing on time.)

One solution is coming: Teletext and two-way videotex are means of presenting information on television screens—a sort of public bulletin board. The information can be broadcast or distributed by cable. It does not interfere with regular television fare, because the information is received during certain short intervals unused in the broadcasting of conventional TV signals.

Until now, teletext has not made much progress in the United States. Some 1.2 million homes in the United Kingdom are equipped to receive service, according to a spokesperson for Ameritext, the New York-based agency for the British system. In this country, videotex is so far available in only a few locations, and has penetrated only a few thousand homes. However, momentum is slowly building in favor of the system.

Watching the faltering (to date) of videotex in the United States, we have not paid much attention to its progress. For instance, an outfit called Travelhost announced grand plans over a year ago to install ter-



Illustration by Dan Culhane

minals in hotel rooms so guests could call up desired information. Travelhost's plans to install 100,000 terminals by the end of last year did not materialize, partly because of technical problems.

Nevertheless, a recent experience convinced us that teletext has merit. In the middle of winter, we were invited to a breakfast press conference sponsored by Management Science America, the independent software operation. At 5 p.m. the preceding afternoon, one of MSA's publicists called to confirm arrangements. What the public-relations department (and several MSA executives flying up from Atlanta that evening) didn't know was that all of New York's airports were fogbound—and they stayed that way all night.

The following morning several dozen editors arrived at the desig-

nated restaurant to learn that the conference had been canceled. (Later we learned that MSA had planned to announce its entry into the business of distributed software for corporate personal computers.)

All this waste of time and energy could have been avoided if the direct link to airline computers offered by teletext had been available in Atlanta and used by MSA. That's why we expect teletext, when it becomes available, to be a big hit with corporations that have many traveling employees.

All you need to receive teletext is a special attachment, which Ameritext says costs about \$300 now. The price of that attachment is dropping steadily, however, as various semiconductor manufacturers, such as Motorola, develop special integrated circuits that provide much of the needed interface. Soon, a single chip should do the job, just as a single chip can perform as a modem in personal computers.

What's more, the capability of home TV sets to present characters in addition to pictures should be upgraded in a few years. Right now, fast-scrolling data are not all that easy to read on a color TV. However, TV receivers now under development in Europe may offer higher legibility.

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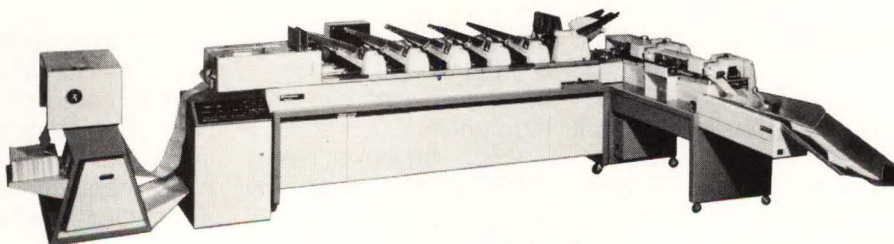
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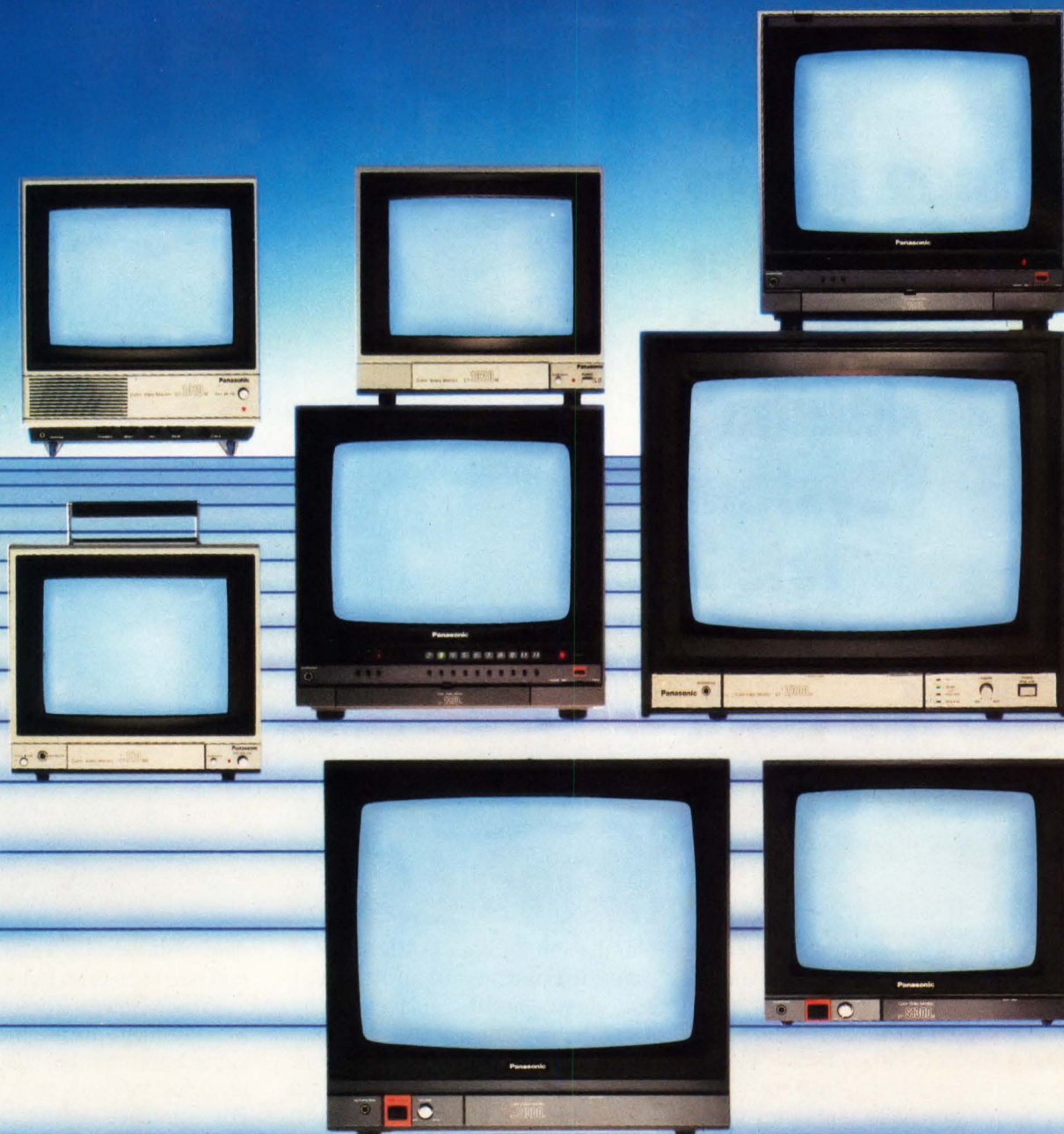
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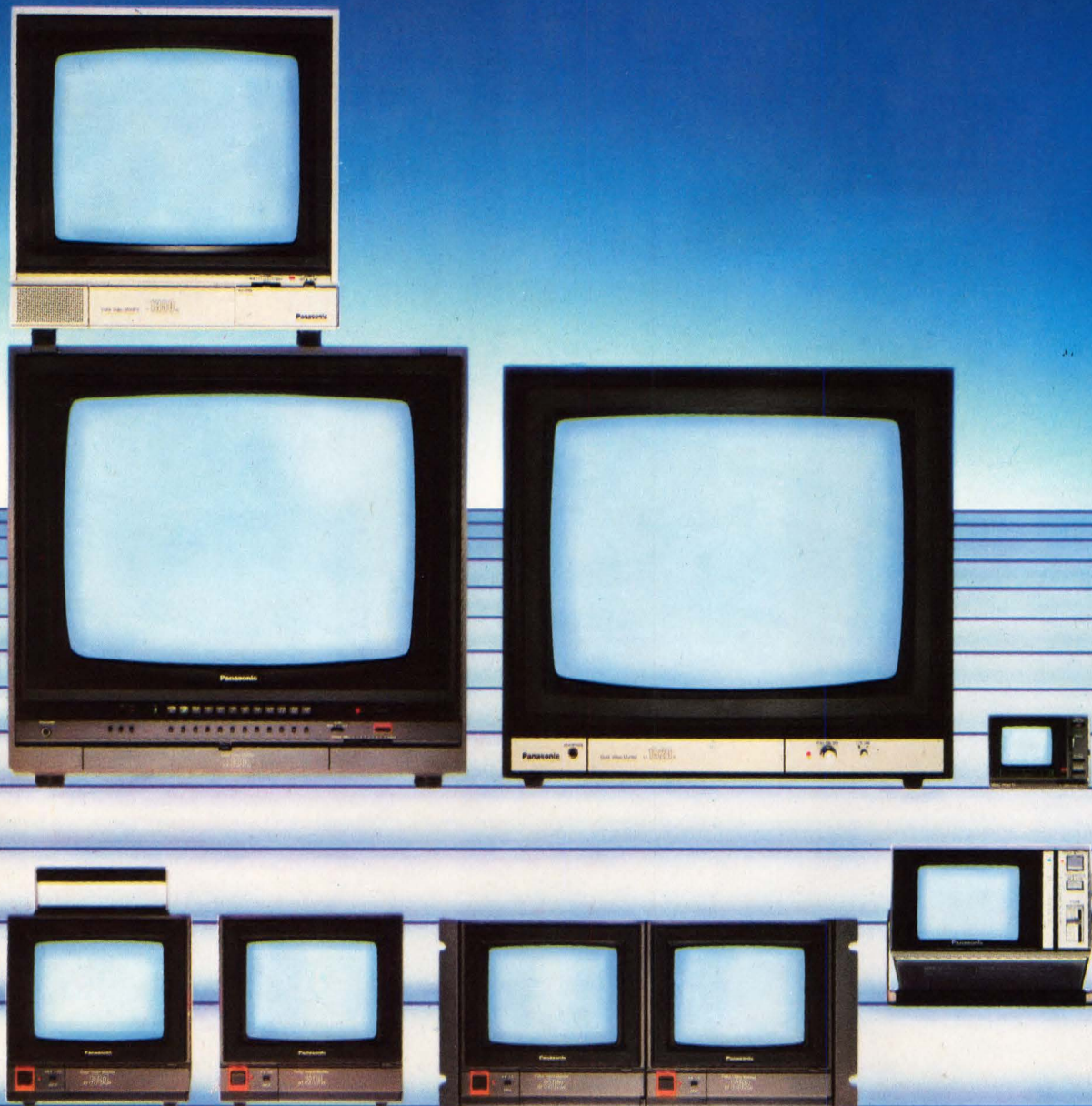
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NEWS & COMMENT

Wordstar bombs in evaluation

Wordstar may be one of the best-selling word-processing programs, but it received a "poor to fair" rating in a recent evaluation. The rating of 30 word-processing programs for the IBM Personal Computer was conducted by *Software Digest* in the first issue of its new *Ratings Newsletter*.

Among the criticisms of Wordstar was that its manual assumes prior computer experience. Reviewers also branded it for requiring a lengthy installation procedure. Reviewers reported that data are sometimes lost when moving blocks of text with the program. Also, they said, overloading the disk directory crashes the program.

Wordstar wasn't the only package to receive poor reviews. Six other major word-processing programs for the IBM PC also got a Bronx cheer. These included: Megawriter, Xywrite II, Spellbinder, Perfect Writer, Finalword, and Powertext.

One surprise: Wordvision, a relatively new program supplied by Bruce & James Program Publishers (San Francisco), was awarded two stars and the highest rating for value. Wordvision is as inexpensive as it is unknown. It sells for only \$80, a far cry from the prices of some of the lowest-rated programs, such as Wordstar, which cost up to \$495.

Only four programs—PFS:Write (\$140), Volkswriter Deluxe (\$295), Officewriter (\$325), and Visiword

Plus (\$375)—received a four-star rating. None of the programs evaluated received the highest rating—five stars.

How was the software evaluated? Each program was put through the same series of tests 10 times, by 10 different reviewers. The reviewers followed the instructions supplied by each software supplier to install the program. They then took up to two hours to learn how to edit a simple letter. In the final phase, reviewers were given a prepared disk file containing a standard one-page letter with text to be changed, deleted, moved, copied, centered, underlined, and printed.

Ratings Newsletter is available for \$135 per year. *The Rating Book*, a companion publication, contains more information about each program, including 180 pictures of menus and screen formats. This will be sold in bookstores for \$14.95. Issues of each publication evaluate only one category of IBM PC software. For information call (215) 649-7000.

Save on business travel

Travel Scan, an interactive, online database of travel information, helps corporations cut travel costs. Corporations can save up to 30 percent on business-travel and entertainment expenses by

using the service, the vendor claims.

Travel Scan lists all airline schedules and fares. It helps corporations make the last-minute changes that are so common in business travel. An executive can make or change a reservation from anywhere, at any time, by making one phone call.

Travel Scan can also be accessed by a standard computer terminal, communicating word processor, or personal computer via a modem. Subscribers pay by the hour to access the Travel Scan database.

Travel Scan is offering a special introductory deal for new subscribers. If a new subscriber books \$5,000 a month in travel and entertainment, he or she will receive a 100 percent rebate on the cost of the Travel Scan Z2000 system, which includes keyboard, screen, and telephone. This system retails for \$849, and features simultaneous voice and data communications, a speaker phone, a calendar, and electronic-mail capabilities. Subscribers that book \$2,000 a month in travel and



entertainment receive a 100 percent rebate on the Quazon 1000, a data-link keyboard that connects to an ordinary telephone and television screen. It retails for \$249. Both the Z2000 and the Quazon 1000 can be used to access Travel Scan's database. For information, call Travel Scan at (212) 695-5492.

(News continued on page 23)

Go-anywhere printer

For fast-moving executives and managers who need a printer for their portable computers, Teletex makes a 3-lb. device that fits in a briefcase. Under the power of rechargeable batteries, Portaprint prints 40 characters per second. Its rate of speed doubles when it's plugged in. The thermal matrix printer can print 80 to 132 columns wide, and it costs only \$199. For more information, contact Teletex at (415) 341-1300.

**Where
can you find
the solutions
to your
compatibility,
connectivity,
portability,
and expansion
problems?**

EVERYWARETM



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Perkin-Elmer introduces **EVERYWARE**TM

At last, a comprehensive application of the world's major hardware, software and communications standards. For your present and next-generation information systems.

You've devoted a lot of time and money developing software programs to meet the needs of your organization. What happens when it's time to upgrade your hardware? Will your software make the transition smoothly? Especially now when the cost of writing and maintaining software continues to climb. How do you protect your existing investment and make all the right moves for the future?

The heart of the problem is the lack of universally applied hardware, software and communications standards. Now Perkin-Elmer has done something about it. Our EVERYWARE product family offers you proven, established and widely supported industry standards. You can live with them now. And tomorrow.

**The compatibility and connectivity problem.
The Perkin-Elmer solution:
EVERYWARE products.**

You face the challenge of developing new systems and software every day. Frequently,

these systems have to become part of your existing processing environment. EVERYWARE products offer the ability to coexist with systems from other manufacturers. This has been achieved in three ways. First, by Perkin-Elmer's commitment to an industry standard operating system. Second, through our commitment to compatible languages. And finally, by our support of all of today's and tomorrow's major communications protocols. As a result, EVERYWARE computers can share information with other systems desk-to-desk, room-to-room, across town and across continents.

**The portability problem.
The Perkin-Elmer solution:
EVERYWARE products.**

The capability to efficiently port your software is another benefit of EVERYWARE products. From computer to computer, department to department, your programs retain their value, protecting your investment. You can develop software on an EVERYWARE computer in

one system and port it to other EVERYWARE computers anywhere in your organization. For example, you can write software on a desktop micro-computer and run it on a supermini. And because EVERYWARE hardware supports an industry standard operating system, you have access to a vast library of third party software.

**The expansion problem.
The Perkin-Elmer solution:
EVERYWARE products.**

Perkin-Elmer offers one of the broadest ranges of computers in the world. It extends from 32-bit superminis to desktop workstations. So you can expand at your own speed, adding the power you need, whenever you need it. As more capacity is required, you simply connect additional processors. You can grow board-by-board, or by adding complete computer systems. Because of the built-in compatibility, there is no need to re-write your applications software. Existing programs continue to run without major alteration.

EVERYWARETM products **from Perkin-Elmer.**

Everything you need for the systems you want.

EVERYWARE hardware: a comprehensive selection.

Our computers range from the Series 3200 superminis—including the economical 3205 and the incredibly fast and powerful 3250XP—to the Series 7000 desktop professional computers, built around the powerful M68000 microprocessor. Since EVERYWARE hardware is based on a distributed processing architecture, it lets you bring the right amount of computing power right where you need it.

EVERYWARE software: unparalleled flexibility.

Since software is your biggest long-term investment, we set out to protect it with several key features. First, we offer a common operating system that spans our entire line of products. Derived from a UNIX* operating

system, this common operating system offers programming productivity advantages. And, all our computers speak the same languages, FORTRAN and C. These languages are bridging tools that link this common operating system and our proprietary OS/32 operating system to give you both developmental advantages and real-time capability.

EVERYWARE software is more than operating systems and languages. It includes Reliance PLUS, a proven relational DBMS that shows how user-friendly a powerful transaction processing system can be. And there is the Resilient System, which links dual Series 3200 computers for high availability processing.

Finally, our operating systems allow you access to the huge library of existing third party

software. For example, you can run a word processing package like VisiWord,TM or a spreadsheet like Supercomp-Twenty,TM and many other popular applications packages.

EVERYWARE communications: a commitment to standards.

EVERYWARE systems can share information with IBM environments via SNA or BSC using emulators for such products as IBM 3270, 3770, HASP and 2780/3780. You can form a local network or join one using Ethernet. And through Perkin-Elmer's PENnet-Plus you can use all the global facilities of the CCITT X.25/X.29 Packet Switching Network. EVERYWARE products conform to the ISO-OSI Reference Model, assuring long-term connectivity.





EVERYWARETM systems



EVERYWARE systems. In finance and insurance.

Today a major nationwide financial network uses Perkin-Elmer computers to flash over 500,000 updates a day to over 11,000 terminals.

EVERYWARE systems. In flight simulation.

Perhaps the most graphic demonstration of Perkin-Elmer computer strength and real-time capability is in the re-creation of flight conditions for the training of pilots and astronauts in the United States and around the world.

EVERYWARE systems. In science.

Perkin-Elmer is the acknowledged leader in the computer-

ization of the lab. We provide the same leadership in computers for seismic exploration and many other fields of science and research.

EVERYWARE systems. Everything you need from one respected source.

Perkin-Elmer is a major manufacturer of advanced computers. Our 32-bit supermini was the first of its kind and our supermini family is the broadest in the business. Computers from Perkin-Elmer are particularly sought after for use in demanding, high availability environments.

EVERYWARE software provides the flexibility to develop, port or purchase programming.

EVERYWARE communications

products comprise the most comprehensive collection of protocols available from a single vendor.

These are decided advantages for those of you already using Perkin-Elmer computers. And exciting considerations for those now planning the evolution of information processing centers.

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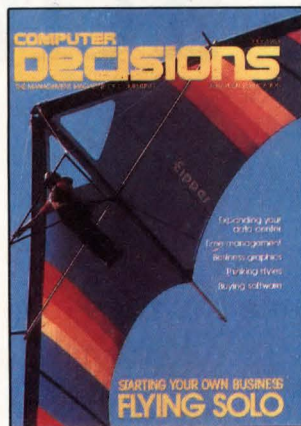
NEWS & COMMENT

(Continued from page 16)

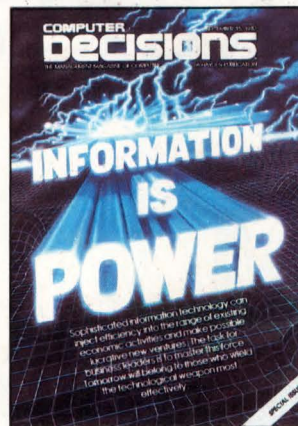
"Arrows" cover hits the mark



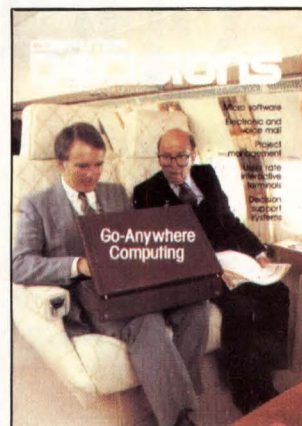
1st place (May)



2nd place (July)



3rd place (Sept. 15)



4th place (November)

Covers that depict threatening or risky situations are the most appealing to readers of *Computer Decisions*. Last May's cover, which finished first in our annual cover contest, obviously touched a nerve among managers responsible for implementing new information-handling systems. It featured a "pioneer" surrounded by arrows.

The winning cover last year (December) depicted a fearsome-looking "headhunter," another threat. In 1981, the "bear trap" cover (July) was the winner. However, the appeal of this genre of covers may be waning—if last July's "flying solo" cover is an indication of things to come. That cover came close to gaining top honors. But the risks of pioneering grabbed the attention of more readers than did the attraction of leaving the corporate fold to start a business. The cover for our Sept. 15 President's Issue, a departure from our usual style, finished third.

A total of 1,879 readers voted in this year's cover contest. This was about one-third more than voted in last year's contest, a reflection of the increased circulation of *Computer Decisions*. A handful of voters were disqualified because they voted for specific features or columns rather than for covers.

Unlike last year's contest, in which 21 readers picked the correct order of

Contest results

	Weighted count	First-place votes
May	2,536	139
July	2,380	131
President's	2,028	121
November	1,232	50
August	1,146	39
September	1,118	32
February	866	38
January	806	22
June	782	35
October	782	16
April	742	18
March	696	26
December	592	26

The total number of valid votes was 1,879. The weighted count was determined by assigning a value of 10 to each first-place vote, eight to each second-place vote, and six to each third-place vote, and then totalling these figures for each month. A few voters made choices for first and second places only.

finish, not one reader hit the right combination this year. Only three voters picked the top three finishers with May in first place. These ballots were placed in a hat and the first name chosen was that of David R. Cochrane, manager of technical services for RTE Corp., a Waukesha, WI, supplier of power-industry equipment.

Cochrane, 38, has held his present position for 18 months, but has been in data processing for 12 years. He "migrated" into dp from engineering

(he holds a bachelor's degree in mechanical engineering from the University of Wisconsin in Milwaukee.)

A *Computer Decisions* subscriber for five years, Cochrane particularly likes our feature articles on managerial topics. Of the 40 employees working in RTE's data center, he supervises six. (RTE runs an old Intel AS6 and an IBM 4341, which will soon be replaced by a 4381.)

Cochrane's prize for picking the top three places in the cover contest is a Walkman portable stereo.

For the second straight year, photographer Ted Hardin shot the winning cover. In fact, last year, he photographed the top three finishers!

Free upgrade for Lisa users

Apple Computer Inc. is offering two upgrades to owners of the original Lisa personal computer. Until June 1, Lisa owners can upgrade their systems to the equivalent of Lisa Model 2/5 free. After June 1, the upgrade will cost \$595. Next month, original Lisas can also be converted to the Lisa Model 2/10 for \$2,495. The second upgrade increases the speed of an original by about 300 percent. The hardware upgrade—which can be performed by authorized Lisa dealers in less

(News continued on page 26)

Is your office operating at a crawl...



↑ HP 150

Maybe the one thing you need to get off the ground is the Touchscreen Personal Computer. The **HEWLETT-PACKARD 150**. Because it's no ordinary machine. Remember the first time

exactly love at machines can first-time users.

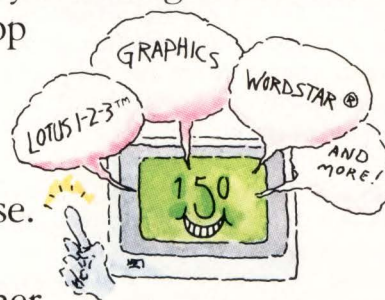
We've made the Touchscreen Personal Computer so easy to use that people like to use it. Very simply, we've taken out the intimidation factor. We've made the new Touchscreen Personal Computer so easy to operate **easy-to-use** that even first-time users can use it. Which means they'll quickly grow to love it. 



For example, to select the software you want to use, **just touch the screen**. So whether you want to work with words, numbers or graphics, all you have to do to get started, is touch the screen. And once you get going, you can change a number in a spreadsheet, or make a chart for a presentation just by touching the screen.

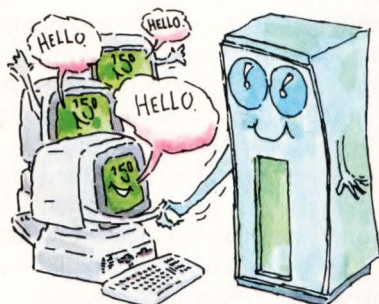
No complicated commands to remember. No desktop gadgets to manipulate. All that's required is the touch of your finger. MultiPlan™, Graphics, WordStar®,

The Touchscreen Personal Computer not only communicates with people. It communicates with other computers, too. Your people are your most valuable asset. But the more information they have at their fingertips, the more valuable they become. The Touchscreen Personal Computer delivers again.



LOTS OF SOFTWARE

when it could be flying?



communication

The HP 150 is fully compatible with the big HP 3000 computers and, with the addition of our new 3278 communications capability, the 150 can talk to IBM® mainframes as well. Your people can call up data, work with it and send it back to the host computer. All this with the use of the keyboard. The HP 150 can also send electronic mail and operate a range of peripherals at workstations. Needless to say, this can really move things along. The Touchscreen Personal Computer is a Hewlett-Packard product. This, after all, could be the most important thing you need to know about it. Your professional reputation depends on the key decisions you make. Office automation is one of those

decisions. You need to know and trust the company you



TRUST

HP 150 at a Glance:	
User Memory:	256K-640K bytes
Operating System:	MS-DOS 2.0
Microprocessor:	16-bit, 8088, 8Mhz
Permanent Memory:	(ROM) 160K bytes
Diagnostics:	Power-on self testing
Display Screen:	Touch-activated, green phosphor 80 characters x 27 lines 9 x 14 character matrix Upper and lower case Simultaneous text and graphics capability 390v x 512h graphics resolution 1024 characters and symbols in ROM
Keyboard:	107 keys, 8-ft. cord attaches to system unit, 10-key numeric pad, 12 function keys (8 screen labeled)
Compact Size:	2.1 sq. ft. desk space
Communications:	2 RS-232 ports (Built-in) HP-IB (IEEE-488) (Built-in) IBM 3278 (SDLC, BSC). Up to 19,200 bits per second Choice of printers (including optional internal printer), plotters, 3.5" and 5 1/4" floppy drives (264KB formatted), Winchester hard discs (5 and 15 MB)
Peripherals:	
Suggested Retail Price:	\$3,995.00

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dBase II is a trademark of Ashton-Tate.
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go with. Hewlett-Packard's long-standing reputation for excellence is a given in the industry. And our service and support will make sure you aren't standing still when you should be flying. See the HP 150 at your local dealer or for information call (800) FOR-HPPC today. Find out how a personal computer with a sense of touch makes a lot of sense for your office.



Setting you free.

Hewlett-Packard Personal Computers



HEWLETT PACKARD

NEWS & COMMENT

(Continued from page 23)

than a half hour—replaces the Lisa's two 5¼-inch disk drives with a faster 3½-inch drive.

The Lisa 2 Series comprises three models, Lisa 2, Lisa 2/5, and Lisa 2/10. Like the original Lisa, the new models are general-business computers. Each computer in the Lisa 2 Series has 512,000 bytes (Kbytes) of internal memory and a 3½-inch disk drive for storage. The Lisa 2/5 and 2/10 share these features, but offer more storage capacity. The 2/5 has an external 5-million-byte (Mbyte) hard disk; the 2/10 has a built-in, 10-Mbyte hard disk.

In addition, the 2/5 and 2/10 have enough storage to run many third-party software packages and a wide range of programs based on Bell Labs' Unix operating system. The Lisa 2, Lisa 2/5 and 2/10 have the original Lisa's features, including pictorial icons and screen windows, a mouse cursor-control device, and



graphics. The Lisa 2 costs \$3,495. The Lisa 2/5 costs \$4,495 and the Lisa 2/10 lists for \$5,495. For information, call Apple Computer at (408) 996-1010.

Satellite bypass by Hewlett-Packard

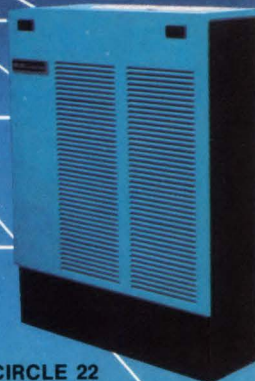
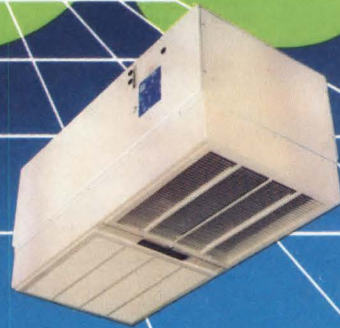
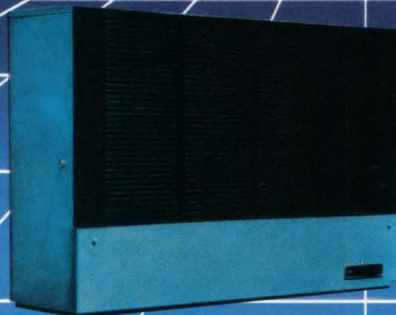
Users of HP 3000 minicomputers now communicate with distant HP 3000s using satellite links and earth stations supplied directly by Hewlett-Packard Co. With the service, the 3,000 users

of HP 3000s in this country can bypass AT&T long-distance communications facilities and local loops.

The earth stations and satellite links are supplied to HP by Vitalink Communications Corp., Mountain View, CA. Employing the Vitalink equipment, two or more computers can exchange data at a variety of transmission rates, ranging from 9,600 bits per second (Kbps) to 6 million bits per second (Mbps). "End users are provided with their own, privately run communications network," says George Ward, Vitalink's CEO. The service allows managers to bypass the sometimes confusing collection of transmission companies that are handling telecommunications in the wake of the AT&T divestiture. It also may help sidestep increased transmission costs through these carriers, he says.

The cost of the Vitalink system is
(Continued on page 28)

HIROSS



Focus on Computer Comfort

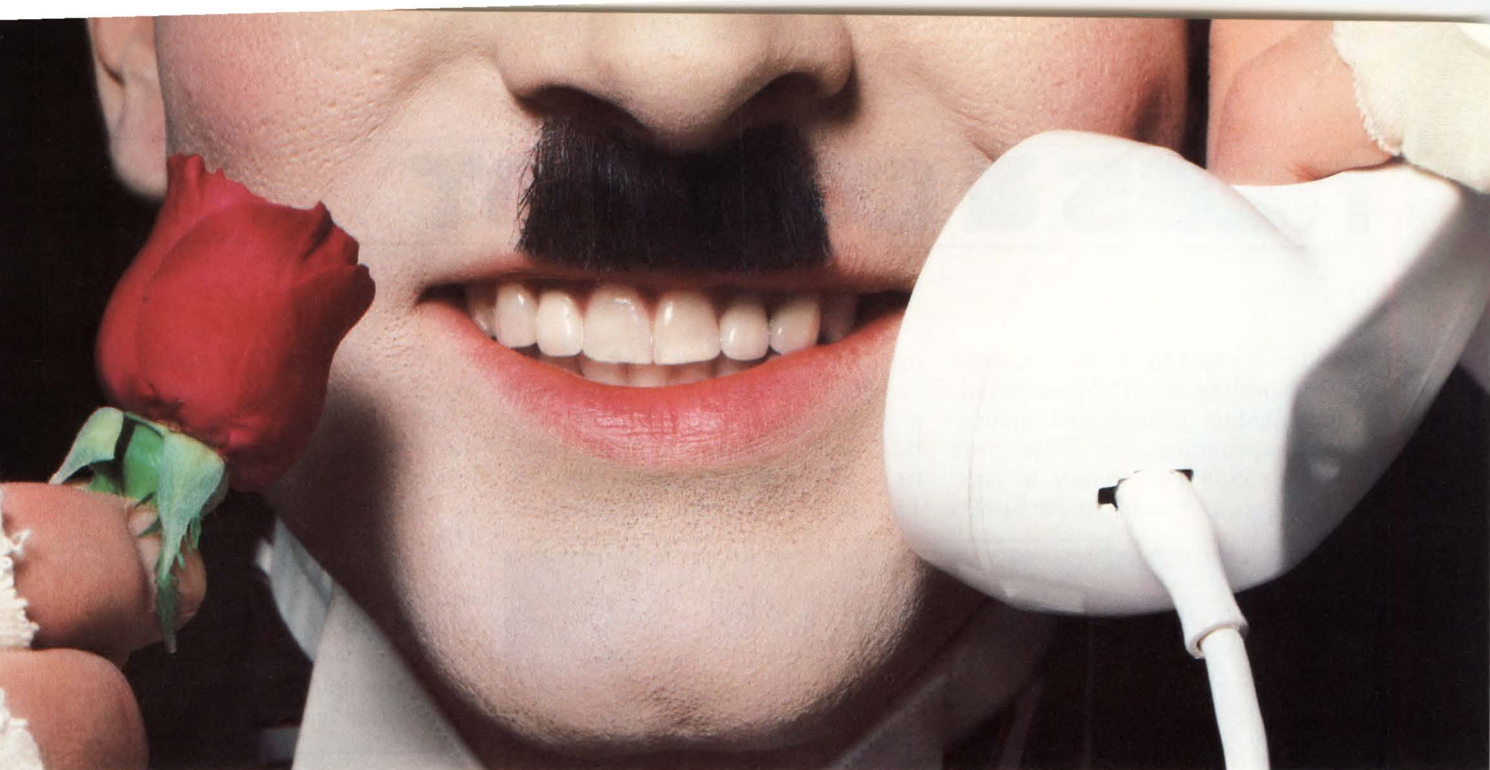
Hiross manufactures a complete family of computer room air conditioners engineered to fit any need — large or small. From a 1½ ton capacity ceiling mounted mini unit to powerful 25 ton capacity units capable of controlling environments in the largest mainframe installations. Temperature, humidity and filtration — all controlled within the closest tolerances.

Total control with total reliability from Hiross — the focal

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Decision Data makes better S/34, 36 and 38 work stations than IBM. The proof? More people choose Decision Data work stations than any other alternative to IBM. Over 30,000 Decision Data work stations have been installed to date.

And now, the new Decision Data work station offers many significant advantages over the IBM 5291 work station.

The Screen. Our glare-free screen tilts and swivels more easily—with brightness, contrast and power switches up front, where they are in easy reach of the operator. Our screen offers both block- and line-cursor styles. To conserve and lengthen CRT life, our screen dims automatically.

The Keyboard. Our contoured keyboard, with molded key caps, offers ergonomic design that opens a new era in operator comfort. Like the screen,

the keyboard provides a choice of tilt positions, plus a palm rest, an erasable scratch pad; an adjustable clicker for loud, soft or silent responses; and a detachable, coiled cord that lets the operator work up to six feet from the screen.

The Decision. With all of these features,

Decision Data's advanced work stations cost less, occupy less space and help operators get more done more easily. Maintenance is provid-

ed by our own highly respected nationwide service organization. Depot-maintenance and annual-maintenance-fee-service terms are available.

You shouldn't buy a work station, a serial, line or letter-quality printer—or any other peripheral for an IBM S/34, 36 or 38 without talking to Decision Data first.



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☐ Please tell me more about the work stations that work harder. ☐ Better yet, I'll phone (800) 523-6529. In PA call: (215) 674-3300

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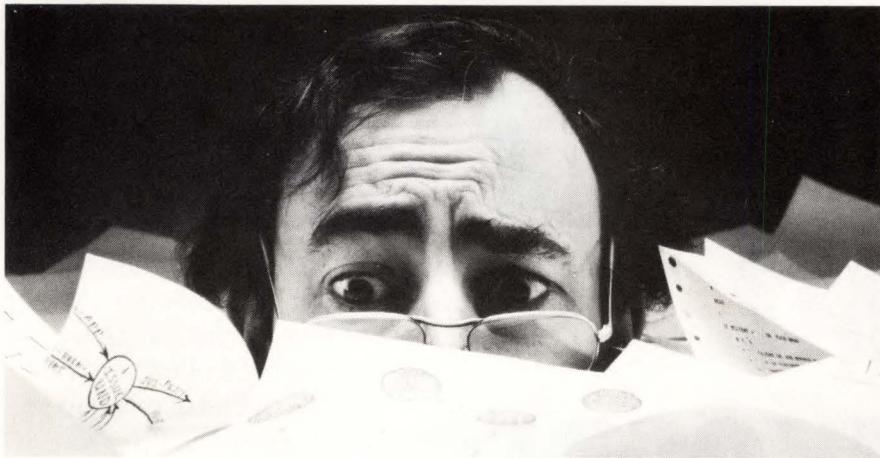
NEWS & COMMENT

considerably less than other methods of transmitting data, claims Ward. An equivalent conventional microwave link, running at 56 Kbps, costs \$8,000 to \$9,000 per month, he says. At that speed, Vitalink costs \$1,800

per month. Startup costs for Vitalink include a \$200,000 fee for equipment and installation and a \$20,000 one-time charge for an HP DSN/satellite-communications installation. The payback for the collection of

charges is about 19 months, says Ward.

HP sales representatives are handling the satellite service, passing orders to Vitalink. Maintenance will be carried out in a similar manner: HP personnel will be the point of contact for system support and will work with Vitalink to resolve problems. Vitalink constantly monitors its customers' networks from a central facility in Mountain View, CA. For more information, call (415) 968-5465.



A little couponwork takes the endless paperwork out of data base design.

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Investment data just a call away

The MIS executive with an eye on the markets may bring his strategy into tighter focus with one of three recently announced products and services.

Invest-Tech is a dialup storehouse of financial analyses of 4,500 stocks, options, and commodities. It also offers informational and service programs. Another new product, PC Quote, lets an investor get quotes on up to 64 stocks and options instantly, just like the professional traders on the floor of the New York Stock Exchange, claims a PC Quote spokeswoman.

Tandy Corp. has also announced a new investment-analysis software package for its Radio Shack TRS-80 Model 100 personal computer. Priced at \$70, Investment Analysis evaluates fixed-income securities, calculates commissions for stock and option transactions, and tabulates the results of option transactions involving put and call purchases and sales. You'll need a cassette tape recorder to make the system go. Call (817) 390-3300 for more information.

Invest-Tech comprises online software and an automatically updated database. A subscriber using any computer with a modem simply dials the appropriate number to gain access to the system.

Lawrence S. Silberstein, president
(News continued on page 32)

"My customers tell me we have the best computer service in the industry."

Dan Tims

"IBM, DEC or Control Data systems—when you need computer service, Control Data will be there. Absolutely. You get a full line of service, including installs and deinstalls, even on mixed-vendor environments.

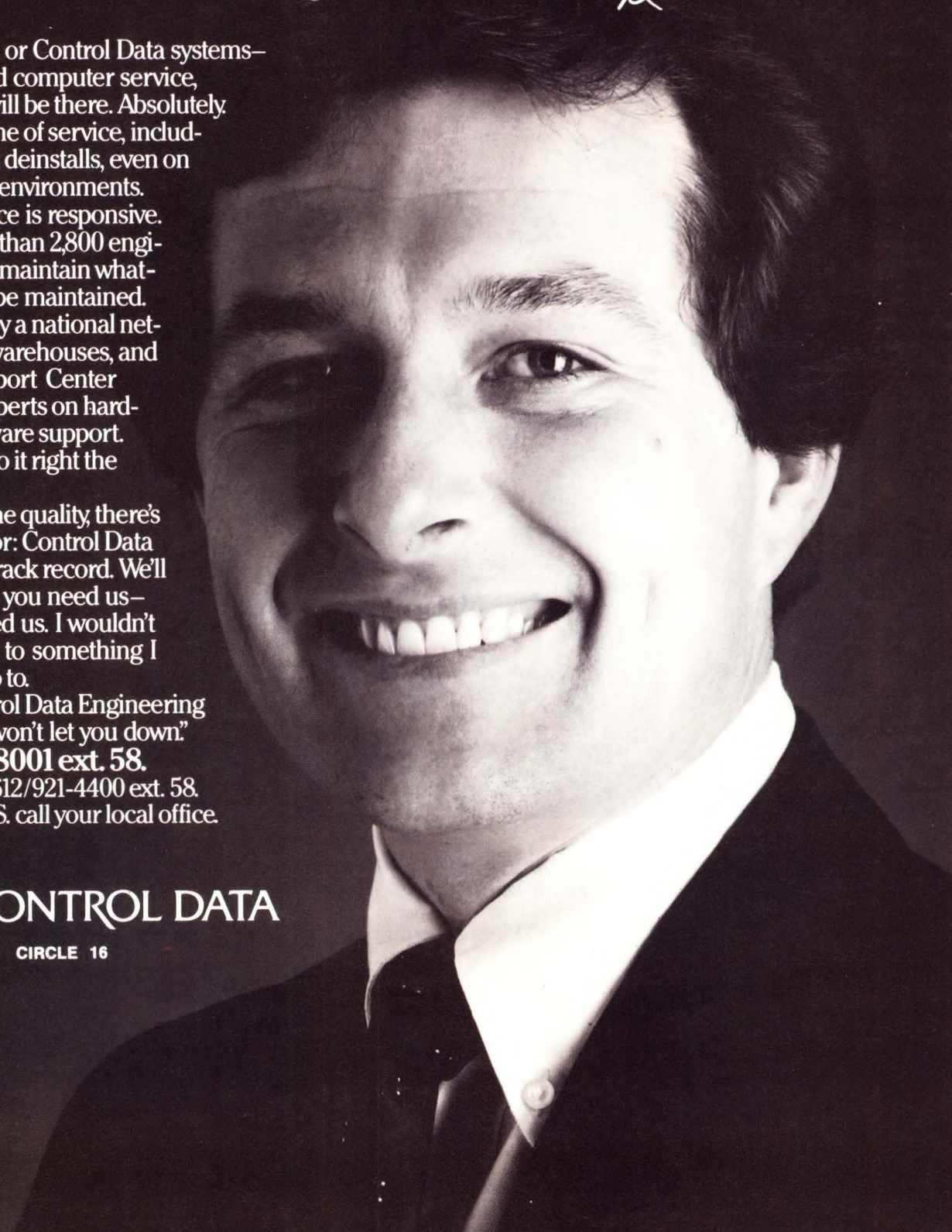
Our service is responsive. Flexible. More than 2,800 engineers, like me, maintain whatever needs to be maintained. We're backed by a national network of parts warehouses, and a Central Support Center staffed with experts on hardware and software support. All to help us do it right the first time.

Besides the quality, there's one more factor: Control Data has a 26-year track record. We'll be there when you need us—where you need us. I wouldn't sign my name to something I couldn't live up to.

Call Control Data Engineering Services—we won't let you down."
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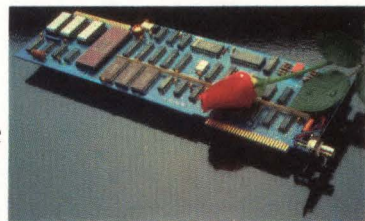
IRMA[™] has worked her way to the top.

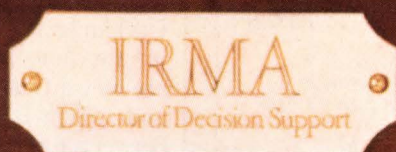
She's Director of Decision Support, the leader in IBM 3270 mainframe/PC networks.

IRMA is taking charge! Her performance in over 25,000 IBM 3270 mainframe/PC installations has made her the industry's leading Decision Support Interface.[™] Why? Because IRMA works. Easily and economically, IRMA's on the job giving PC users mainframe data access, selection, storage and communication back to the mainframe.

She's more capable than ever.

IRMA is a printed circuit board that slips into any available IBM PC/PC XT slot and attaches via coaxial cable to a 3270 controller. She's as easy to work with as the PC itself and provides standard text file transfer software





for VM/CMS and MVS/TSO mainframe environments, in addition to optional APL Terminal Emulation.

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Other IRMA products give you more ways to build cost-effective IBM 3270 and IBM PC-based decision support networks.

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NEWS & COMMENT

(Continued from page 28)

of Investment Technologies Inc., Metuchen, NJ, notes that his product is more timely than similar offerings because it is updated daily and weekly (many other packages are updated monthly). Unlike timesharing ser-

vices like Dow Jones News/Retrieval, Invest-Tech offers current information *and* securities evaluation.

Invest-Tech can, among other features, counsel investors on the best time to buy and sell options and com-

modities, measure stock volatility and reward-to-risk ratio, and allow investors to screen stocks according to factors like price-to-earnings ratio and growth.

Invest-Tech's financial analysis is based on tried and tested formulas. Over an 18-year period, the value of a model portfolio climbed from \$900 to \$14,000 using the Invest-Tech formula, while the Dow Jones Industrial Index average only increased from \$900 to \$1,150, says Sharon Cote, Invest-Tech's operations manager.

Subscribers pay a \$250 registration fee, a \$1 call-up fee per stock (a minimum of \$20 a month), and a time charge for using the phone lines (via Telenet, \$12 per hour before 7 p.m. and \$6 per hour after 7 p.m.) Call (201) 494-1200 for more information.

PC Quote costs \$495 for software that allows an investor to dial up the service; it also formats information. An additional fee of \$13.50 a month must be paid to the New York Stock Exchange for last-sale and bid/ask information. Database time charges are 50 cents a minute between 8 a.m. and 6 p.m. and 25 cents a minute between 6 p.m. and 8 a.m.

To operate PC Quote, you need a personal computer with 128 Kbytes of random-access memory, an asynchronous-communications port, a 300- or 1,200-baud modem (1,200 is preferred), and a monitor. Call (312) 922-9423 for more information.

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New online software catalog

MIS/dp managers seeking information on personal-computer software can save hours of research by hooking up to the One Point Electronic Catalog, claims ITM, the catalog's developer.

The catalog is a database containing information about 5,000 software packages for IBM-compatible personal computers. It also contains evaluations of the packages by ITM

(News continued on page 36)

The CPT Solution that talks with mainframes in an important new way:

CPT solves the costly, cumbersome problem of separate data terminals and word processors at individual workstations.

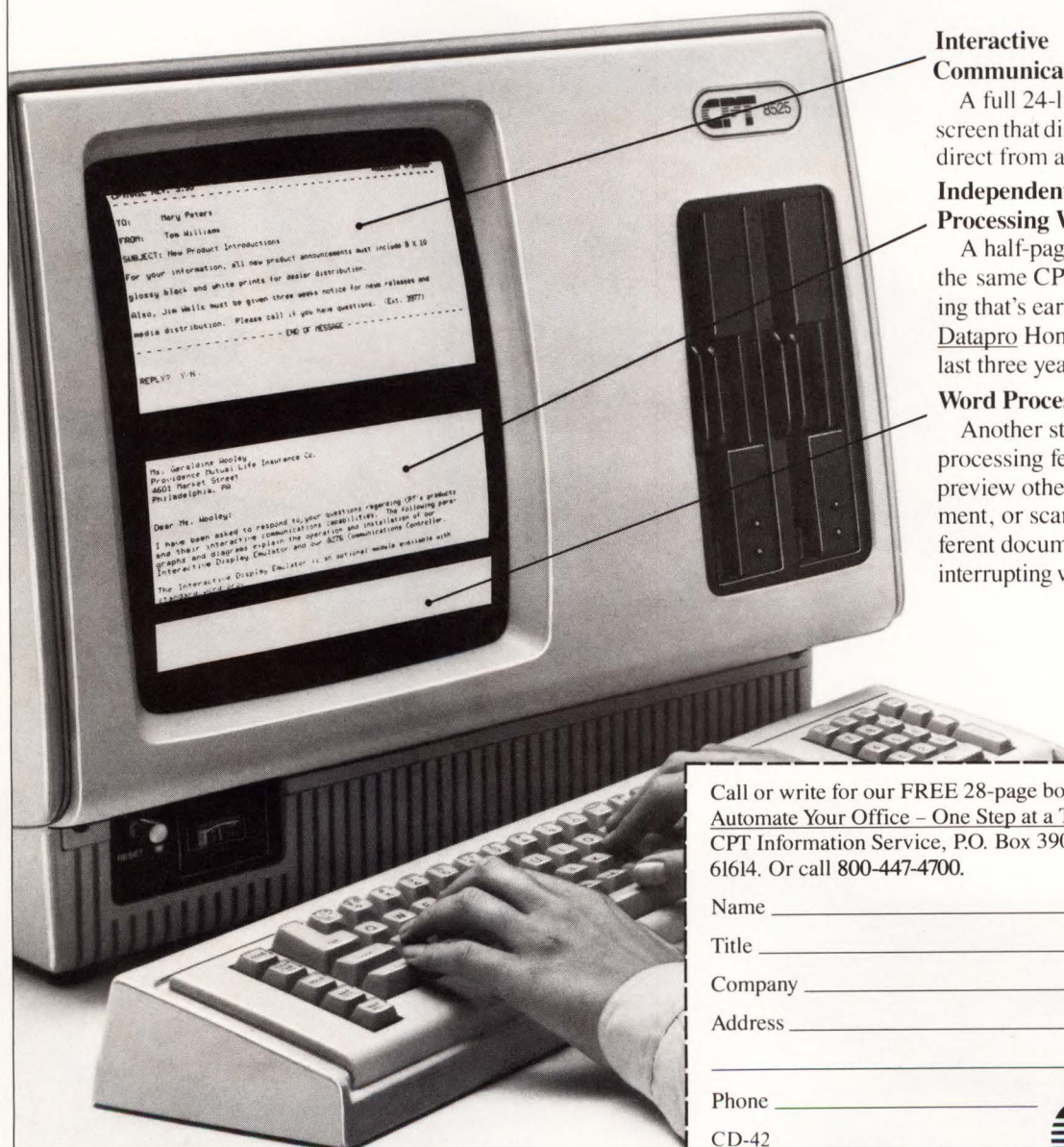
An exclusive software breakthrough enables one CPT system to perform both functions. On the same screen. At the same time. We call it the CPT Interactive Display Emulator (IDE).

With this new CPT solution, an operator can transfer data processing information from a host computer (top

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In addition, an optional CPT SNA communications controller can link up to 7 CPT systems together as part of an IBM 3270 network.

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complete line of compatible computer products for every office need.

The Integrated Electronic Office by DATAPOINT brings the revolution in distributed processing right to your desktop, with state-of-the-art multifunction workstations and microcomputers backed by a broad range of peripherals, including a laser printer and a

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color graphics system. Innovative technology brings you easy access to word processing, data processing, electronic mail, and data communications in a fully integrated system.

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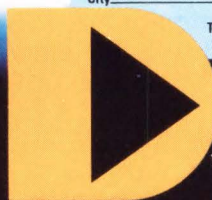
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M111

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DATAPOINT
We sparked the revolution.

NEWS & COMMENT

(Continued from page 32)

staffers, user groups, and software magazines, according to the vendor. ITM claims to list 90 percent of the IBM-compatible software titles.

ITM likens the service to an "electronic department store." With only a

personal computer and a modem, a user can access the product information, choose a package, and *order it*.

"The real value of this service is that it makes it so easy to get the information, especially for the MIS

director who has to be able to sell a new product to management," says Amy Voorhees, ITM spokeswoman.

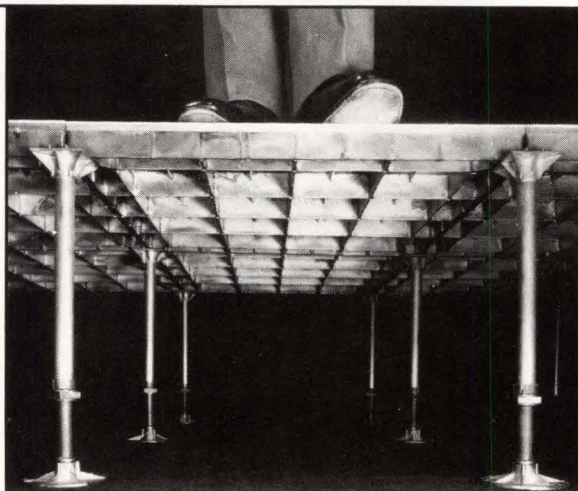
Hooking into the catalog costs \$100 to start. Subscribers also pay a fee based on the amount of information they draw out of the database. If, after perusing an index, an inquirer chooses to look at the complete file of one product, he or she is charged between \$3 and \$5, says Voorhees. Of course, subscribers pay to use the telephone lines to access the service. For information, call (415) 947-0850.

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Car pollution cripples computers

Automobile pollution may be the cause of mysterious mainframe ailments. Hydrogen-sulfide contamination in the "make-up" air drawn into pressurized data centers may be at the root of supposedly undiagnosable problems.

Hydrogen sulfide is one of the pollutants emitted by cars, and is especially prevalent in high-traffic areas. Fortunately, there is a cure. The make-up air can be filtered and passed through chemicals that absorb the dangerous contaminant.

The Busch Co., Pittsburgh, makes one such special filter, and has begun supplying them to data centers in high-traffic areas. Unfortunately, the "ultra filters" are expensive. A data center with 10 tons of air conditioning may require an ultra filter that costs between \$40,000 and \$50,000. Most of the filters must be custom-made. For more information, call (412) 487-7100.

Making the right connection

Of 70 large corporations that use IBM Personal Computers, 80 percent require improved connections to other IBM PCs and to mainframes, according

Only Lee Data's Universal Terminal System can satisfy all of your information processing needs...

3270, Async and personal computing.

Finally, there's a single, universal way to satisfy the individual information processing needs of all your people. From sales manager to accountant. From research to production. The Lee Data Universal Terminal System can do it all.

And our system is modular by design to provide you any or all of these cost-effective, problem-solving advantages:

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Combine complete 3270 system-compatibility with an innovative Lee Data design and you have a System that delivers greater convenience and flexibility.

Our System not only offers standard 3274-compatible local and remote control units, but now also provides combination local/remote controllers with a unique dual-host access capability.

In addition, you can choose from a full line of terminal capabilities, beginning with our cost-effective 3178-compatible display on up to our popular All-In-One Display which offers, in a single unit, four selectable screen sizes—including 132-column—a great advantage in program development, spread sheet applications and many others where flexibility is required.

3270-plus-Async: another cost-effective advantage

If your application needs currently find you switching between 3270 and VT100-style terminals to get the job done, Lee Data has a better way.

As part of our System, you can enjoy the further advantage of a 3270/Async capability that allows dynamic selection of 3270 and VT100 operating modes from a single Lee Data display. A simple command entered at the keyboard provides you access to applications

running on an IBM CPU, non-IBM systems (such as DEC, H-P or Prime), as well as timesharing services. Another Lee Data solution to simplifying your company's terminal network.

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That's right! Now our System also includes a sophisticated personal computing package that can easily be integrated into an existing Lee Data 3270 system.

With our approach, you get continued interactive access to host-based files, plus all the advantages of

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professional business computing from the same Lee Data workstation.

Advanced features include a host file transfer capability, a single-board design, four standard system expansion slots and, of course, complete IBM-compatibility.

All these additional capabilities plus the same user-friendly Lee Data displays.

Plus these added benefits...

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Combine this with all the outstanding features already mentioned and you'll find a System offering everything you need for efficient, cost-effective operation.

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NEWS & COMMENT

to a study by Strategic Inc. "IBM PC user reactions and requirements," released in December, surveyed corporations that own a total of nearly 2,000 IBM PCs. "Although 46 of these companies projected purchases that equal almost 2,300 new IBM PCs within the next year, none were entirely happy with their current systems," the survey reported.

According to Dr. Lew Glendenning, director of information-systems research at Strategic, no vendor has provided an effective connection. The study reports that IBM PCs are used mainly as 3270 terminals by 31 percent of the companies, as parts of a mainframe-based network by 6 percent, and as both terminals and personal computers by 24 percent. The need to share systems, data, and peripherals is critical to all these companies, and 3270 emulation does not necessarily support this feature. Floppy disks were also found by most companies to be inadequate for sharing data.

The solution most frequently mentioned by companies was the use of an effective local-area network for IBM PCs, yet only 12 percent reported using such a network. According to most companies, networks do not allow users to access mainframe databases. Companies also feared that networks would lower performance levels by increasing user autonomy. Networks were also considered too expensive, and buyers often found themselves confused by the variety of network products.

The survey costs \$950. For more information, call (408) 243-8121.

Earth-shattering CAD system

Computer-aided design (CAD) has taken a quantum leap from being a simple drafting tool to providing multi-dimensional analyses of earthquakes. A system developed by Ebasco Services Inc., New York, allows scientists to more accurately predict

the occurrence and impact of earthquakes.

The system was tested in the Mount St. Helens region, where more than 5,000 earthquakes were recorded between 1978 and early 1983.

It warned scientists of the onset and increase in earthquake activity in the months before the major eruption of the volcano.

The key to the system's usefulness is its ability to analyze information

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from a number of "disciplines." At Mount St. Helens, for example, five dimensions of information were gathered on each quake: date and time of occurrence, magnitude, latitude, longitude, and depth of the quake.

The system color-coded each dimension so that all of them could be simultaneously viewed.

The Ebasco system also displays earthquakes chronologically, allowing scientists to examine trends. Plots

of any size and scale can be printed from displays.

Better forecasting can help engineers improve structural design, and possibly reduce construction costs. The traditional method of plotting earthquakes on paper takes days, but the Ebasco CAD system provides analysis in seconds. "Such an advancement in the state of the art helps answer both federal and state demands for increased safety from earthquake damage in the design and construction of dams, power plants, and major public works," says Joseph L. Ehasz, Ebasco's chief civil engineer.

The Ebasco CAD system runs on PDP and VAX computers from Digital Equipment Corp. In the basic version, which costs \$5,000, the system includes an Intergraph workstation. Higher prices depend on the system configuration. For more information, write to Ebasco at Two World Trade Center, New York, NY 10048, or call (212) 839-1000.



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(Continued on page 40)

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news & comment

PC management studied by firms

A study of how 25 large organizations effectively manage personal computing is under way at two Massachusetts management-consulting firms. Index Systems Inc. and Hammer and Co. Inc. are collecting data from more than 300 users of personal computers and 175 managers with direct responsibility for personal computing in both user and data-processing departments.

The study will include a review of the personal-computing policies and procedures at each of the 25 companies. The results will be released at a conference in Boston later this month. For information, phone Index Systems' Walter J. Popper at (617) 492-1500.

Salaries on an uphill climb

Starting salaries for data-processing professionals this year are an average of 4.5 percent higher than those for 1983, according to an estimate by Robert Half International, an employment agency.

The firm bases its estimate on the salary increases a nationwide sampling of managers expect to give this year. The responses were gleaned from thousands of position requests submitted to the employment agency. An analysis of the "survey results" is broken into findings for large, medium, and small organizations. The number of dp professionals employed determined the size of an organization. Large organizations employ more than 50, medium-sized organizations employ 15 to 49, and small companies have fewer than 15.

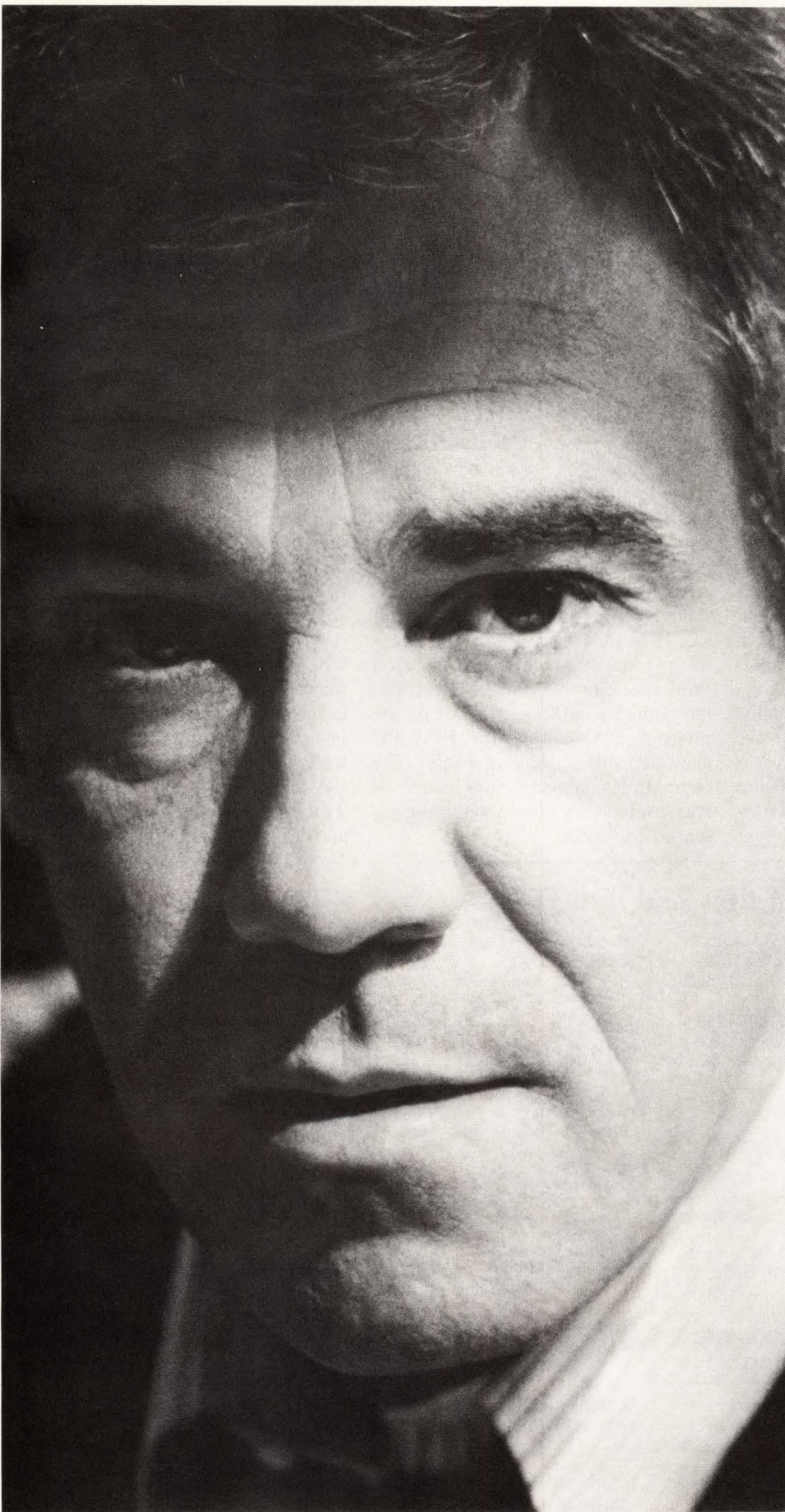
Large corporations are offering MIS directors starting salaries of up to \$71,000. The minimum salary was \$52,000, up 3.4 percent over 1983. Other findings include:

- Project managers can expect starting salaries of between \$32,000 and \$40,000, up 5.9 percent from 1983.
- Systems programmers will find starting salaries in the \$27,000-to-\$37,500 range, a gain of 4 percent.
- Starting database administrators are being paid between \$31,000 and \$40,000, a 9.2 percent increase.

In medium-sized companies, project managers are starting at \$29,000 to \$36,000, a 3.2 percent increase over 1983. Systems programmers can expect starting salaries of between \$28,000 and \$37,000, a 4.8 percent hike. And programmer/analysts will find a minimum starting salary of \$22,000 and a maximum of \$30,000, up 4 percent.

Smaller companies are offering project managers between \$24,000 and \$31,000, an increase of 3.8 percent.

These figures are national averages that fail to provide insight into geographic variances. Geographic factors should be applied to starting salaries of \$50,000 or less. A free copy of the study can be obtained from Robert Half International by calling (212) 221-6500.



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by Susan Foster Bryant, Microsystems Editor

PERSONAL COMPUTING

Coping with the compatibility craze

The word *compatible*, when applied to computers, used to mean mainframes that could run the same programs as IBM machines. More recently, the term has been applied to personal computers that can run the same programs as the IBM Personal Computer. Manufacturers of micros have learned it pays to play the IBM PC-compatibility game.

Why the rush to copy the IBM PC? The answer can be found in the soaring revenues the PC is pulling for Big Blue—vendors of compatibles want a piece of the action. Does IBM-itis have any affect on you and your

corporation's users? Most definitely.

The makers of compatible computers follow the standards IBM set for the PC's microprocessor, disk drives, keyboard design, color resolution, price, and, most importantly, operating system and software. But although compatibles may look and act like IBM PCs, they aren't exact copies and may not do everything you think they can. Software is a particularly touchy subject. Not all of the programs written for the IBM PC can run on all of the compatibles. The compatibles increase your range of choices, but they also increase the potential confusion.

Early in the history of personal computers, manufacturers were close-mouthed about the guts of their machines. The logic was that by hiding the details of the technology behind the machine, a supplier could prevent upstarts from producing copycat machines. This protectionist paranoia was quickly abandoned when IBM handed out technical manuals on the PC to anyone and everyone—and still produced a roaring success. IBM didn't leave itself wide open, however. It copyrighted the input/output system of the PC. Thus, IBM invited copiers to imitate, not duplicate, its design. (Continued)

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Circle 850

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Pronto Computers
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Circle 863

NEC
(312) 228-5900
Circle 870

Operationally compatible

Bytec Mgt.
(613) 226-7013
Circle 846

Kaypro
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Circle 933

Data compatible

Docutel/Olivetti
(914) 631-8100
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Wang Labs.
(617) 459-5000
Circle 864

Onyx
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Circle 871

Columbia Data
Products
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Circle 847

Panasonic Industrial
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Altos Computer
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Circle 860

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PERSONAL COMPUTING

(Continued from page 42)

The easy availability of information about the IBM PC opened the floodgates for software and peripherals for it. Now that everyone knew what made the PC tick, suppliers could make products or write programs that were just right for it. Al-

though this fact might not be germane for home users, the impact of it in the office was a stunning new idea: continuity. Suddenly, all corporate information resources from mainframes and minis to printers to mass-storage devices to PCs could be

hooked together. Gone were the headaches of trying to connect products made by many vendors. Big Blue bought the business world—or so it seemed.

The real significance of the IBM PC's rise to popularity, however, was the birth of the compatibles subindustry. Companies with names like Eagle, Corona, Bytec, Compaq, Televideo, Leading Edge, Olivetti, and Seequa began offering IBM PC-like computers, usually for a lower price. Other suppliers offer software and peripherals that operate with the IBM PC.

The number of IBM look-alikes and compatibles makes your buying decisions complicated. One vendor's idea of compatibility doesn't conform to that of another vendor. Suppliers of compatibles haven't helped clear the confusion. For example, one vendor in a recent ad asked, "Who else is more IBM-compatible functionally?" After reading that question, you might be prompted to ask what functionality has to do with the issue. The answer is that there are actually four levels of compatibility, according to Future Computing, a market-research house in Richardson, TX.

Operationally compatible is the closest you can get to the real thing. These machines have an 8088 microprocessor like the IBM PC's and they can run software written specifically for the IBM PC (this software is packaged with a special label). They can also read and write from IBM floppy disks and offer the same display, keyboard, sound, and user interface for documentation. The Bytec Hyperion, Columbia Data's MPC, the Compaq portable, the Eagle PC, the Olivetti PC, the Seequa Chameleon, the Panasonic Senior Partner, and the soon-to-be-available Kaypro notebook portable fall into this category.

Functionally compatible personal computers use either an 8088 or an 8086 microprocessor and run their own versions of IBM PC programs. These machines can't use IBM PC peripheral cards and they have a dif-

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ferent user interface. They can, however, read and write from IBM disks. The Data General Model 10, the Texas Instruments Professional Computer, and the Mindset Personal Computer are examples.

Data compatible computers have the same characteristics as functionally compatible machines, except that they can't run IBM PC programs. However, they can be made functionally compatible. Micros in this category include the Eagle 1600, the Grid Compass, the Gavilan portable, the Hitachi PC, NCR's Decision Mate, Olivetti's M20, the Pronto Series 16, and the Wang PC.

MS-DOS compatible is about as far as a machine can get from the IBM PC and still be called compatible. These personal computers run MS-DOS, a relative of the IBM PC's system (PC-DOS), but they can't run IBM PC programs, can't read or write from IBM disks, and can't use



The Olivetti PC is one of several "operationally compatible" personal computers. It can run programs written specifically for the IBM Personal Computer.

IBM PC peripheral cards. However, they can be modified to become data compatible.

Of course, managers always have the option of buying the real thing rather than try to figure out the vagaries of compatibility. Many managers resort to imitations because the IBM

PC is in short supply. Also, compatibles generally cost less and are often portable, and until only recently, IBM didn't sell a portable.

If you buy compatibles, the most important criteria to measure the machine against are the following.

- Does the machine run IBM-labeled software?
- Does it use add-on boards designed to supercharge the PC?

If your selection passes these tests, if your corporation is an IBM shop, if pricing and service provisions are good, and if the compatible vendor appears to be healthy and likely to survive, as they say in Silicon Valley, go for it.

That is, of course, unless casting your lot with Big Blue doesn't serve the best interests of your organization. Although the giant and its flock of courtiers constitute a powerful force, there are other personal computers from which to choose. □

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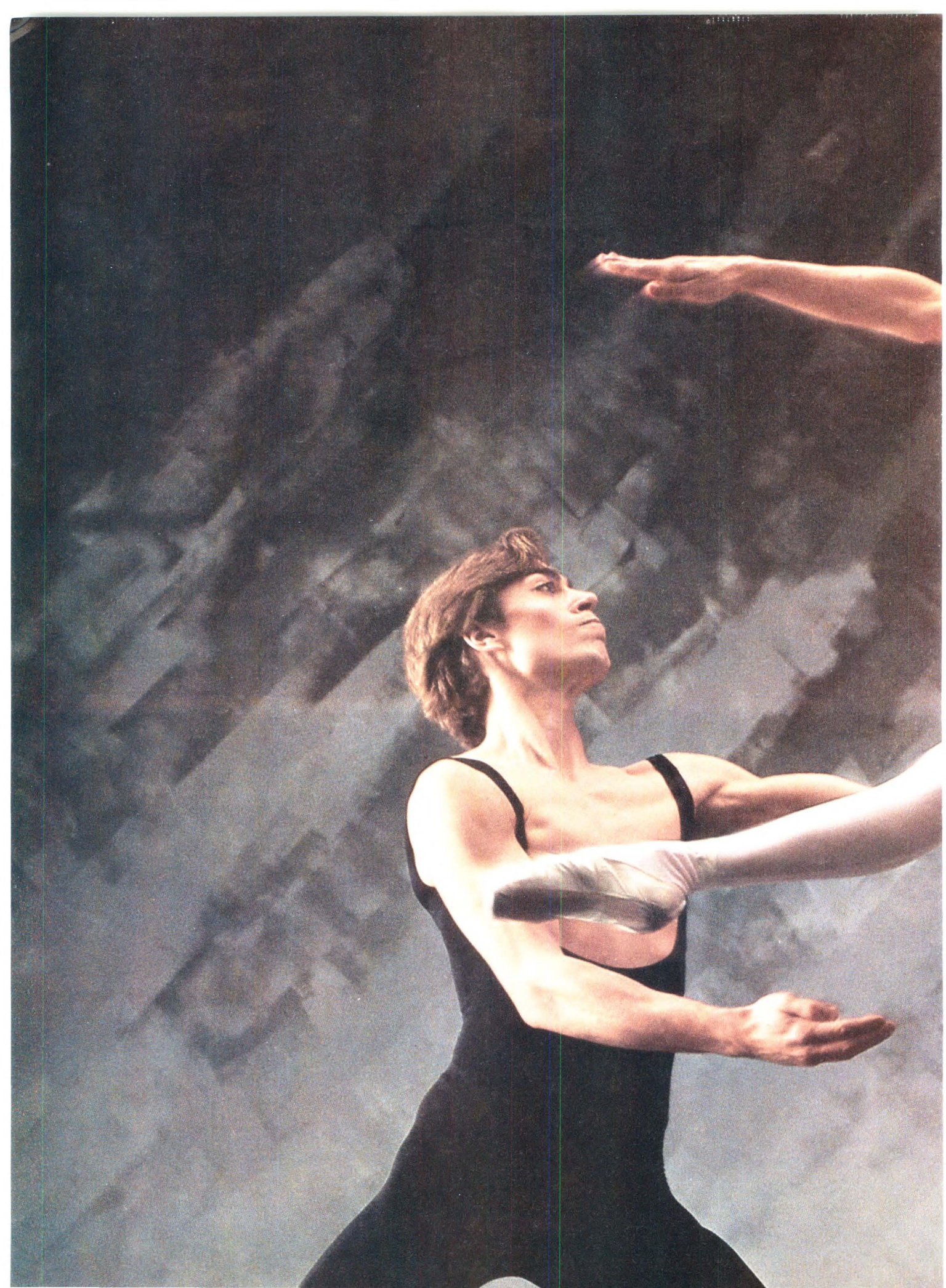
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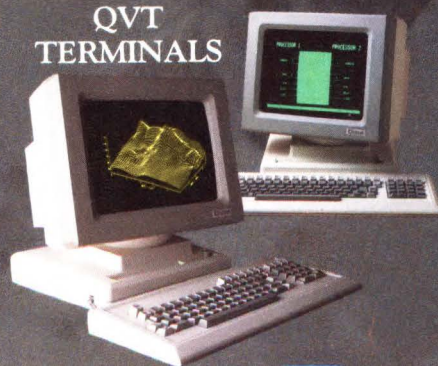


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by Jan Snyders, Midwest Editor

SNYDERS ON SOFTWARE

Auditors and data processing

At this time of year, the mere mention of the word "auditor" is likely to strike fear into the heart of even the bravest soul. For information-handling executives, the word takes on a new and less formidable meaning. Computer-age auditors have titles such as audit officer, manager of dp audits, computer-audit manager, edp auditor, and director of internal audit. Rather than focus solely on the dollars and cents of a business, computer auditors are more concerned with the accuracy and efficiency of data systems and software.

Banks that buy their software rather than develop systems in-house make the auditor's job more difficult. The Maryland National Bank of Baltimore has such a policy. "This approach puts the auditing department in a tough situation. To keep abreast, we have to try to audit the systems as they come in," says Louis Ullrich, assistant audits officer. To ensure thorough audits, Ullrich purchased Cars from Sage Systems. His department uses Cars to audit data that will be affected by a new software purchase, before and after a package is installed.

Maryland National Bank has \$5.7 billion in assets and 197 branches. It runs an IBM 3083 and an NAS 9050, supporting 175 IBM 3276 and 3278 terminals under TSO and CICS. Major applications include demand deposit, savings, certificates of deposit, and installment loans.

Approximately 300 Cars programs handle various applications that require much exception reporting. When the financial staff submits a

request it wants to run against the system, Cars and TSO provide the data. According to Ullrich, the software can determine when a record was last updated. If the record has been inactive for a set period, it can be deleted to save disk space.

Cars also boosts programming productivity. "We're probably saving 75 percent to 80 percent of the time it takes to generate a small program," says Ullrich. "We have one full-time and one part-time programmer. If we didn't have Cars, we would need five full-timers."

Easy-access files

Stephen Clyde, manager of dp audits at Pennzoil Co., depends on auditing software to accomplish tasks



Auditing software provides easy access to any file, maintains John Wardlaw, senior system consultant at Anderson Clayton.

that were previously impossible. Pennzoil, a diversified natural-resources company, has operations in

the United States and abroad. In 1983, the company had 9,000 employees and sales of \$2.2 billion. Ninety-five percent of the assets, which exceed \$3 billion, are located in the United States.

In Houston, where most of the data-processing functions are performed, the company has a 24-Mbyte 4341, an 8100, a 5150, and a System/34, all from IBM. The Duval Corp., a division in Tucson, AZ, uses a DEC VAX 780. Satellites aid in communication between the two sites. Pennzoil also has a network of over 500 IBM and DEC terminals. Accounting is a major application.

In 1980, Clyde was looking for a package designed specifically for auditors—something that would help audit and process information. In 1981, he installed the Text Comparator from Dataware.

The Text Comparator compares many elements, such as 80-column records, with source codes. "We take a copy of a production program and a copy of authorized changes, compare them independently, and then make sure the information on the new and old programs matches up," says Clyde. This procedure ensures that only authorized corrections have been made on a production program. "You have to be very careful when using a package like this," says Clyde. "In fact, you might overdo the checking process because it's so easy."

Anderson Clayton, a multinational conglomerate with 1983 sales of \$1.7 billion, began as a cotton merchant in 1890. By 1984, in addition to cotton and cotton-seed processing, Clayton's interests included warehousing, insur-

(Continued on page 50)



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SNYDERS ON SOFTWARE

(Continued from page 48)

ance and manufacturing truck parts.

Anderson's 24-Mbyte IBM 3081 supports a network of several hundred remote job-entry terminals and 60 minicomputers from Datapoint and IBM. The terminals are mostly IBM 3270s. Since the company is so diversified, the data system contains many types of accounting.

Several years ago, Anderson's life-insurance carrier was harmed by a major fraud. Accountants were brought in when management decided to build up the audit operation in order to do more dp audits. "We needed a tool to get in and look at the computer files," says John Wardlaw, senior systems consultant. Dyl-Audit from Dylakor was installed.

The package is primarily used to audit the insurance carrier and the animal-feed business. "In the insurance end, you can apply statistical samplings," says Wardlaw. "We'll do any known kind of statistical routine that mathematicians can dream up." While Dyl-Audit was initially installed for auditors, it is also being used by accountants, financial analysts, planners, and budgeters. Even the operations staff uses the system to generate special reports.

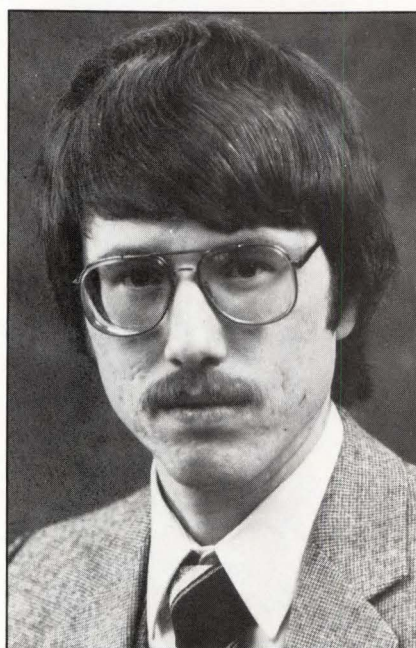
Wardlaw has found that the auditing package provides easy access to almost any kind of file. "Before we started using Dyl-Audit, we had a system that was written in Cobol," says Wardlaw. "It was very inflexible. Every time we used it, we'd have to get a programmer to help us. It would take us three times longer to perform an audit." Auditors can now get into files, develop routines, and program for themselves.

Air Products and Chemicals in Allentown, PA, is equally satisfied with its audit package. According to Fred Alicea, senior dp auditor, the company's internal auditors can access and analyze MIS files without depending on programmers.

In 1983, Air Products and Chemicals had sales of \$1.6 billion and 16,000 employees nationwide. It manufactures and distributes chem-

ical and gas products, such as liquid nitrogen and oxygen, used by auto and carpet manufacturers.

The company has a 16-Mbyte Amdahl 470 V-8 and a 24-Mbyte IBM 3081 with about 700 online IBM 3270s. Major applications fall into three categories: business,



Public Service Co. of Indiana's new audit package can verify software accuracy in hours instead of weeks, says Patrick Mitchell, systems-software analyst.

engineering, and science. Business applications handle inventory, production and manufacturing costs, and finance. Engineering does budget reporting and science covers simulation.

Prior to installation, Air Products had no difficulty with auditing, but the auditors needed access to production files. In the past, the auditor had to depend on programmers to provide samples for the annual accounts-receivable confirmation. Thanks to the EDP-Auditor from Cullinet, the auditor can make selections, audit files with heavy activity and verify the integrity of production files. Thus, auditors can develop programs and run their own jobs. They can also check information in the files, thereby send-

ing out fewer confirmation notices.

When auditors can retrieve their own information, productivity increases. The Brunswick Corp., based in Skokie, IL, was in the market for a package that would increase productivity in its auditing department. It installed Auditing Software Application Development Aid (Asada) and Audex 100 from Arthur Andersen and Co.

Brunswick is a conglomerate with annual sales in excess of \$1 billion. Its products range from bowling and fishing equipment to valves and controls. The company's data centers are decentralized, but headquarters houses an 8-Mbyte IBM 4300 Series machine for accounting consolidation, treasury, and treasury-stock applications plus machine-resources and financial forecasts. Approximately 100 IBM 3270s and IBM Personal Computers access the main computer.

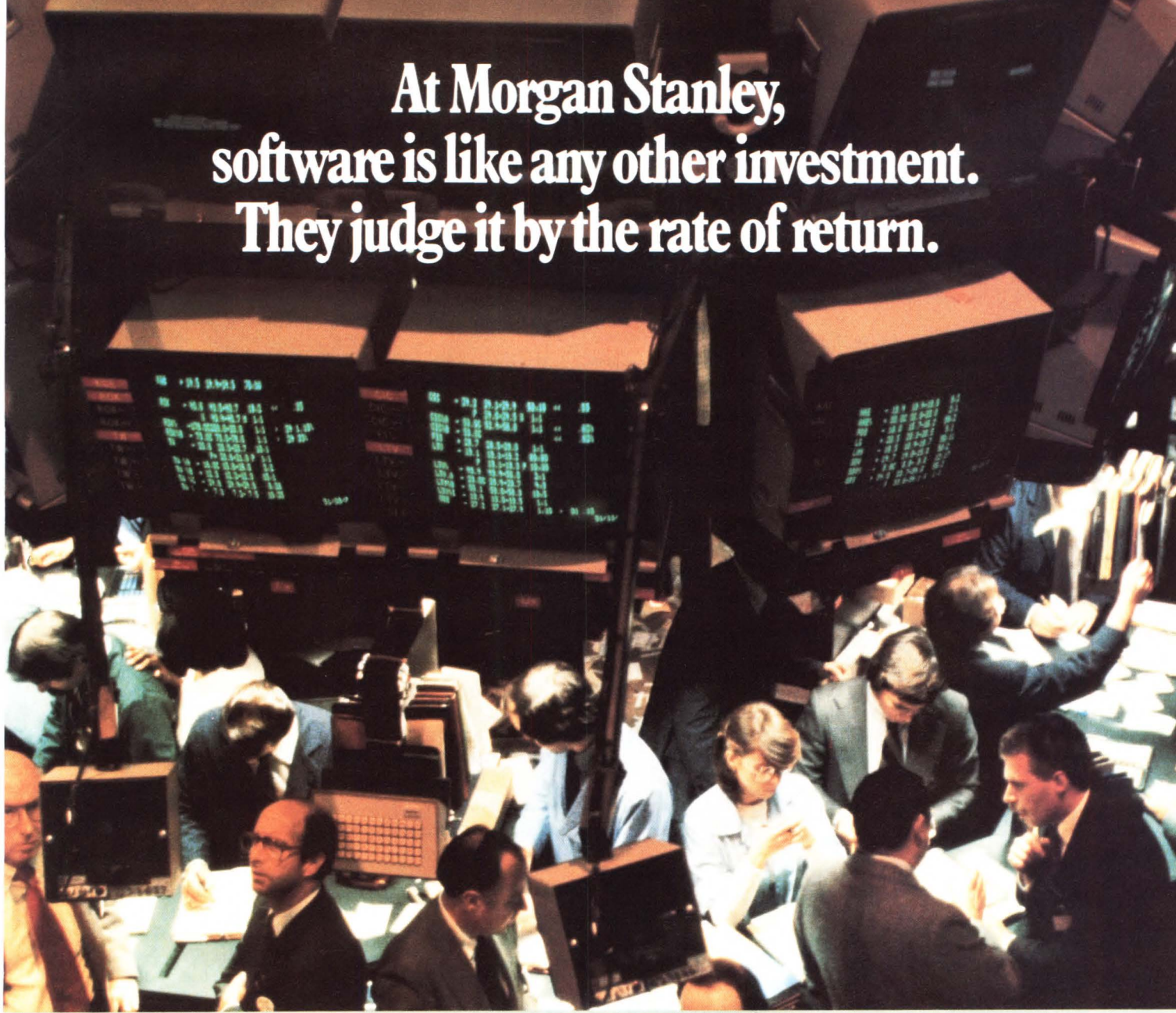
Since Asada and Audex 100 interface with one another, they were installed simultaneously. An audit application was then developed with Asada on an IBM PC, and was transferred to the mainframe, where it executed the Audex 100 application using client data.

"We have a full-time and a part-time programmer. Without Cars, we'd need five full-timers."

Ullrich, Maryland National Bank

Brunswick's audit department is responsible for working with Arthur Andersen to audit the business and finance departments, for auditing operations to improve efficiency, and for auditing new applications brought into the system.

According to David Honeycutt, manager of communications and financial systems, Brunswick is well-pleased with its auditing package. "First, we get leverage from applying this resource in conjunction



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SNYDERS ON SOFTWARE

(Continued from page 50)

with our financial-audit techniques," he says. "Then, we analyze the entire population or look at similar transactions."

Conventional-auditing techniques were limited by manual resources. "To perform all auditing functions manually would be economically infeasible," says Honeycutt. The reliability of audit findings increases when you can analyze the total transaction.

Anyone can do it

The MCM Corp. of Raleigh, NC, had several different computer systems consolidated into one data center. FACS from Computer Data System best-suited MCM's needs.

MCM (\$200 million in 1983 sales) is a holding company for several medium-size and small insurance carriers. In 1980, MCM Information Services Inc. was created to centralize data processing and concentrate common information bases

into one computer. The data center has an 8-Mbyte IBM 4341 and a 16-Mbyte NAS 7000. A mix of 300 IBM 327X terminals accesses the computers.

With the aid of FACS, new employees can run all job-control

"We found that auditing packages improved the productivity of our auditing staff."

Honeycutt, Brunswick

languages (JCL), track and file, program usage, and detailed information for operations. "The primary benefit of FACS is its ability to interrogate the JCL so that we can understand it," says Robert Taylor, vice president of MCM's information services division. "We were a new

operation, with new employees that weren't familiar with the company—and no one was familiar with the application."

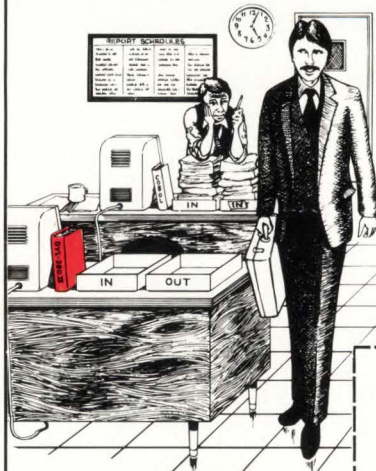
Applications are brought into the computer and run through to ensure that they all have the same codes and file structure. "It was a matter of mechanizing a very mundane, tedious documentation process," says Taylor, "and/or learning enough about the applications to estimate where all the interfaces might be."

According to Taylor, it would have been impossible to move both the data and the system from various locations into one center without the auditing package. "It gave us the flexibility to audit all of the software until we found which packages were best for the data center," says Taylor. Without the appropriate software, each package would have had to be evaluated separately.

(Continued on page 54)

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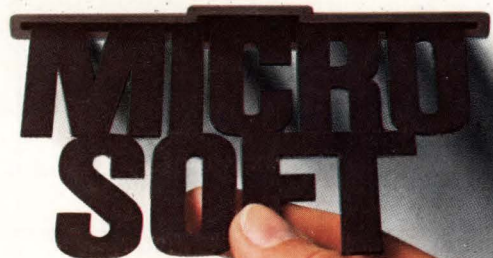
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SNYDERS ON SOFTWARE

(Continued from page 52)

The major dp problem facing the Public Service Co. of Indiana (Plainfield) was that no one seemed to know what and when changes were being made in the production system. "I've been with this company eight years," says Paul Mitchell, systems-software analyst, "Many times a program went awry, and the programmer had no way of knowing why."

Public Service, with 6,000 employees, provides electricity to 69 of the 92 counties in Indiana. It utilizes a 24-Mbyte IBM 3081 and a 16-Mbyte 3033. Its 500 terminals include IBM 3278s and 3279s, Telex

287s and 178s, and Memorex 2078s and 1377s. Major applications include primary accounting functions and a mapping system for checking company equipment.

To clear up the confusion, a new software package was needed. Applied Data Research Inc. (ADR) has a product called Librarian with an option called Compairator. Combined, these two products are called Libaudit. Now when a source program is updated, Libaudit automatically calculates the changes, applies them, and creates the necessary audit trail.

The utility has also developed routines to use ADR's Roscoe, a utility package, for maintaining source codes. The Roscoe Programming Facility (RPF) allows programmers to update records. Mitchell explains: "When a programmer decides a package is ready, he or she updates the production source code, lengthens modules into the production of the libraries, and invokes Libaudit to update and create an audit trail." The program will then function without intervention from programmers.

Prior to installing Libaudit, only

(Continued on page 58)

Auditing software

Vendor	Package	Requirements	Price	Circle
Applied Data Research (201) 874-9000	Libaudit	IBM 370, 43XX, 30XX, and PCMs IBM 4321, 4331, 370/115, /125, /135, /138, and PCMs	\$14,700/OS \$8,400/DOS \$6,400	710
Arthur Andersen (312) 580-0069	Audex 100 and Asada	IBM 360, 370, 43XX, or 30XX tied to IBM Personal Computers	\$10,000	711
Carleton (617) 482-9870	Auditec	IBM and PCMs under OS, DOS, and VM; large-scale Honeywell	\$25,000 to \$30,000	712
Compact Data Syst. (818) 992-4361	FACS	Any computer under OS	\$4,500	713
Coopers & Lybrand (212) 536-2000	Auditpak II	IBM 360, 370, S/3, and S/34	\$6,000	714
Cullinet Software (617) 329-7700	EDP-Auditor	IBM 360, 370, 43XX, and 30XX	\$20,000	715
Dataware (716) 876-8722	Text Compairator	IBM 370, 43XX, and 30XX	\$3,000	716
Dylakor (213) 366-1781	Dyl-Audit	IBM 360, 370, 43XX, 30XX, and PCMs	\$2,950 per yr. (5-yr. lease)	717
Informatics General (213) 716-1616	Mark IV/ Auditor	IBM 370, 43XX, 30XX, and PCMs	\$4,000 (with purchase of Mark IV ADS or Answer/2)	718
Pansophic Syst. (312) 986-6700	Panaudit	IBM 360, 370, 43XX, 30XX, and PCMs	\$19,900/OS \$15,900/DOS	719
Peat, Marwick, Mitchell (212) 872-7713	Syst. 2190	IBM mainframes under OS and DOS, S/34; medium-sized Burroughs	\$15,000	720
Sage Syst. (301) 231-8686	Cars	Variety of mainframes Variety of minis	\$15,000 \$10,000	721
Shaw Syst. Assoc. (713) 782-7730	Audit	IBM mainframes; HP 3000	\$8,000	722
Unitech Syst. (312) 986-0133	U/ACR	IBM under OS/MVS and DOS/VSE	\$12,000 to \$19,450	723

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Functional Analysis

The purpose of this report is to show the interrelationships between the growth of the various segments for Revenue, Expenses, and Profit. The functional analysis is designed to show the interrelationships between the various segments of the business and to show the impact of the various segments on the overall business performance.

The first step was to consider quarterly unit sales. A model built using information from the past two years was used. The information from the past two years was used to build a model that would project future performance. The model was built using historical data and was validated using historical data.

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2	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
3	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
4	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
5	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
6	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
7	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
8	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
9	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
10	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
11	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
12	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
13	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
14	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
15	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
16	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
17	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
18	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
19	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
20	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
21	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
22	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
23	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
24	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
25	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
26	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
27	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
28	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
29	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
30	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
31	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
32	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
33	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
34	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
35	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
36	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
37	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
38	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
39	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
40	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
41	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
42	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
43	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
44	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
45	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
46	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
47	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
48	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
49	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
50	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
51	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
52	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
53	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
54	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
55	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
56	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
57	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
58	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
59	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QUARTER
60	PRICE/UNIT	UNIT PRICE	UNIT PRICE	UNIT PRICE	UNIT PRICE
61	REVENUE	EXPENSE	ANNUALIZED	4TH QUARTER	ANNUALIZED
62	UNIT SALES	2ND QUARTER	2ND QUARTER	2ND QUARTER	2ND QU

MANAGE USER SERIES

Cincom's new MANAGE USER SERIES™ combines the benefits of personal computing capability, mainframe power and greater data processing control into one comprehensive Decision Support System.

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- MANGRAF is an advanced business graphics tool that provides output from on-line applications using centralized production data base information.
- MANCALC is a 3-Dimensional electronic spreadsheet that facilitates "corporate-size" models and can automatically load information stored in

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MANTEXT SECTION DAN LIB... DAN DOCOR: JENNY

1 2 3 4 5 6 7

considerably. After consideration is given to various market and production variables, it is determined that pricing is the variable that can best impact profitability.

The next step was to build another model, again using MANCALC and MANGRAF showing the impact on unit sales and revenue at various price increase levels. It has been determined that 5% annual price increase will optimize Apex's revenue without negatively affecting unit and sales potential, and therefore, optimizing profit margins. This is in line with both inflation and competitive price increases.

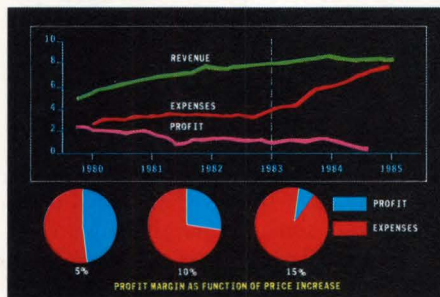
BOX 8.02

END 10.60

1 RECOMMENDATION: a 5% price increase would maintain the desired growth in unit sales, would increase the growth in revenues, and would help restore Apex's previous profit margins.

BOX END

MANTIS - Text Processing



MANGRAF - Business Graphics

(A1A)	(A1)	RCF BUNKER	YOU ARE NOW IN END USER MODE (UE)			
	A	B	C	D	E	
1						
2						
3						
4						
5						
6						
7						
8						
9	1981	1ST QUARTER	2ND QUARTER	3RD QUARTER	4TH QUARTER	
10	UNIT SALES	454.00	482.00	495.00	512.00	
11	PRICE/UNIT	28.00	28.00	28.00	28.00	
12	REVENUE	12,712.00	13,496.00	13,860.00	14,336.00	
13	EXPENSE	10,169.40	11,066.72	11,642.40	12,328.84	
14	PROFIT	2,542.60	2,429.28	2,217.60	2,007.16	
15						
16						
17						
18						

MANCALC - Spreadsheet

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critical records—such as those on customer billing—were kept when programs were changed. Programmers were supposed to manually check all changes, but they tended to stick program listings into a drawer. If the programmer was unlucky and had to recheck data, he or she might have to search through mounds of paperwork to find what had been altered. "With Libaudit, the programmer can find out what the program looked like on a specific date and the computer can list changes," says Mitchell. "A job that used to take days can now be completed in just a few hours."

Financially frugal

A brokerage house can also save valuable time by obtaining an auditing package. According to Ronald Berman, director of internal audits at A.G. Becker Paribas Inc. of New York, an audit that used to take three employees a week to complete can be accomplished in 30 minutes with Audit from Carleton Corp.

Becker deals in stocks, government securities, and municipal bonds. Its 2,500 employees are located in 12 offices throughout the United States. Approximately 500 IBM 327X terminals access an IBM 3032 for accounting applications.

Becker's auditing department examines how various trades are processed to ensure that commissions are being generated properly and that salespeople are getting the appropriate commissions. Auditors also investigate stock activity.

The internal audit department was created about 30 months ago. "One of the first things I noticed about this company was its great reliance on computers," says Berman. "It is very inefficient to go through massive computer runs to extract and audit data and provide management with information." Computer runs from a service bureau can generate up to 10,000 pages a day. It takes days—at times weeks—to cull needed information from so much data.

In November 1982, Becker in-

stalled the Auditec auditing package, and has used it daily ever since. Like other companies that have audit software, Becker is saving many work hours per day.

The auditing department has cut overhead by developing an accounting system. "First we wanted to analyze some expense categories to find out who was spending what," says Berman. "We also needed to know whether existing policies and procedures were adequate to protect us—or to cut costs."

By using payroll information and employee information, managers can now estimate who is spending how much in each department. Before installing Auditec, no manager had any idea what the various expenses in all the departments amounted to.

There is, of course, more than one way to save the most precious commodity—time. By purchasing an auditing package, a service bureau can encourage its customers to create their own reports. This is precisely what the Gesco Corp. in Fresno, CA, did when it installed Panaudit from Pansophic Systems Inc.

Gesco mainly services savings and loan (S&L) associations. With 300 employees, it provides online dp services for about 26 S&Ls in five states. It uses an IBM 3033, a 3083, and a 4341 mainframe operating under MVS. Its 68 Automatic Teller Machines (ATM) are a mix of Docutel TT 2300 and IBM 3624s. It also supports about 7,000 devices ranging from Bunker Ramo 2001 terminals to IBM 3270s to IBM PC and Radio Shack TRS-80 personal computers. Major applications for clients and in-house operations include accounting systems, fixed assets, and savings and loan applications.

When Gesco was founded, the Gesco Management Information System (GMIS) was created. According to Skip Lucas, an internal auditor, GMIS permitted clients to peruse files to a limited degree. The customer could describe accounts with various attributes and Gesco would generate a report—provided

the request was on a specific type of account. The system was unable to create letters for mass mailings or perform other ancillary tasks.

After Panaudit was installed, customers without dp expertise were able to generate programs and reports in-house. With the help of Pansophic's Easytrieve, Gesco's MIS system could interface with the customers. They can't control the codes, but customers now have complete control when jobs are run so they can generate reports as needed.

"Without our audit package, it would take three times as long to perform an audit."

Wardlaw, Anderson Clayton

The auditing department uses Panaudit to verify the accuracy of production code. It is also helpful when balancing figures. "I can take a new file that has not been processed, run totals on it, and then balance both against the manual processing totals," says Lucas. Gesco handles more than 500,000 transactions a day. When you reach the point where there're not enough calculators and paper around for your audits, an auditing system becomes indispensable, he says.

Satisfaction guaranteed

Auditing packages were developed for auditors who have little or no dp background. All the managers interviewed were satisfied with the speed and efficiency of their packages. However, they offered helpful hints they overlooked:

- Spend enough time training users.
- Stress the importance of learning all functions and extra features of the system.
- Get as many employees as possible to participate in training sessions. This includes the programmers, financial staff, and auditors.
- Try out your package first. □

"IDMS/R represents a major advance in database technology."

Dave Litwack*

Because IDMS/R is the first relational DBMS designed for both the DP professional and the end user.



**David Litwack is Cullinet's Vice President of Product Development. Mr. Litwack has contributed significantly to the many technical advances Cullinet has achieved in database software products, including IDMS/R. Mr. Litwack joined Cullinet in 1976. He is a Cum Laude graduate of Brandeis University and holds a Masters in Computer Science from Boston University.*

IDMS/R is not only a relational database management system, but a particularly powerful one. IDMS was made relational by removing all pointers and allowing the user to define data as tables and providing the traditional relational operators such as selects, projects and joins. The major benefit of a relational DBMS is the capacity to develop applications faster because the developer does not have to be concerned with the database design. IDMS/R provides this and much more.

For example, the Automatic System Facility (ASF) of IDMS/R is a major advance over fourth generation languages. The ASF is so comprehensive and easy to use that all a user need do, to develop an application, is define a relational record. The Automatic System Facility dynamically generates all necessary supporting structures including data definitions, screen formats, application processing logic, and documentation. So, the developer can witness the application being produced, literally, in seconds. This capability makes IDMS/R the

perfect system for the end user.

Data processing professionals can use the ASF to help develop production applications. The ASF can be used to build a prototype that can be enhanced, using Cullinet's fourth generation language, ADS/OnLine, into a complex production application. But, when they build a complex high volume application using IDMS/R, DP professionals require outstanding performance. Typically, 5% of the data relationships (joins) in any application are accessed 95% of the time. With IDMS/R, they can simply change these relationships to predefined joins and benefit from a dramatic boost in performance. We call it Relational Fastpath. Relational Fastpath makes IDMS/R a unique DBMS and a perfect system for DP professionals' system development needs.

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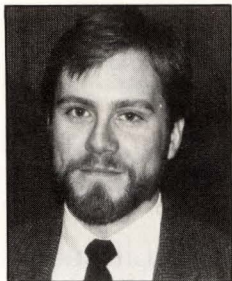
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CIRCLE 36



by David Roman, Staff Writer

TRAINING

Filling a training manager's shoes

Who coordinates the teaching of data-processing skills in your organization? Chances are someone's got the job. That person may work alone or with a staff, part-time or full-time, just gathering information or deciding what training will be delivered and to whom . . . depending on the size of your organization and the objectives of its training program. Although the responsibilities of training managers are organization-dependent, professional trainers have definite ideas about what training managers should and shouldn't be.

"Every company has someone who's aware of training, even if it's a secretary who just collects and files brochures," says Steven Gamer, the director of marketing for the Technology Transfer Institute of Santa Monica, CA, presenters of the James Martin Seminars. This worker may be "casual" about his or her part-time training responsibilities, according to Serge Beauregard, executive vice president of Deltak Inc., the training-course vendor based in Naperville, IL, "but that's better than not having anybody. At least one person is becoming knowledgeable about what's on the market."

Project managers or line managers may oversee training as long as the job doesn't call for a full-time employee, "but once you have 100 employees or so, there's probably a need for a full-time training person," says Ed Yourdon, chairman and founder of Yourdon Inc., the New York consultants and trainers. Steven Brandt, chairman of the board for Cdex Corp. (Los Altos, CA), which creates microcomputer-based training courses, says appointing a full-time training manager "is not so much a question of how many people you train, but of how much money you

spend. If you're spending \$200,000 a year on training, then it makes sense to have someone managing that."

That someone might also be responsible for assessing the special training needs of the dp staff, for evaluating available courses or methods of instruction, for writing courses, for negotiating contracts, for developing and personalizing each worker's training curriculum, or even for apparently unrelated assignments like planning the company's annual Christmas party—which was the responsibility of one trainer I spoke with recently. Whatever the particular objectives of a training manager may be, he or she will always be training's liaison to corporate management, and therefore responsible for "getting training into the consciousness of the management structure," according to Naomi Estes, the development support center manager for IDS/American Express, the big financial-services operation in Min-

neapolis. "Training managers have to get close to their management colleagues and get them thinking about training as part of the corporation's data-processing plans."

Who trains the neophytes?

A new world of users is now being trained on personal computers, and in many organizations that job has been placed in the already-full hands of the training manager. "Personal computers add a whole new dimension of responsibility to a trainer's job, and many of them are overwhelmed by it," says Joyce Monaghan, the vice president of Executive Computer Network Inc., a group of training consultants based in Fairfield, NJ.

Instead of burdening one manager with the job of training all data-processing professionals *and* all end users, some companies have split their training jobs in two. Two managers (or two staffs) handle the different kinds of training separately. "The most successful cases I've seen are those where the dp professionals and the end users are trained under different individuals," says Robert Torgler, the manager of business professional marketing for the National Accounts Division of IBM.

In many organizations, the training of end users, many of them *new* users, has become the job of the information center. Torgler calls the information center "the focal point of end-user satisfaction." Originally promoted by IBM as an in-house organization dedicated to decreasing unwieldy application backlogs in the dp department, information centers have, for many, evolved into something like education centers, largely because of the rapidly growing use of personal computers.

Torgler explains: "Technology



Joyce Monaghan of Executive Computer Network says many trainers are overwhelmed by the added responsibility of personal-computer training.

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TRAINING

brought onto the scene an explosion of workstations that offered significant opportunities for productivity increases by non-data-processing professionals. Forward-looking companies recognized the need for a 'missioned' organization that would be accountable for training the masses of non-dp users. The information center became that missioned organization." (A roundtable on information centers is scheduled for the June issue.)

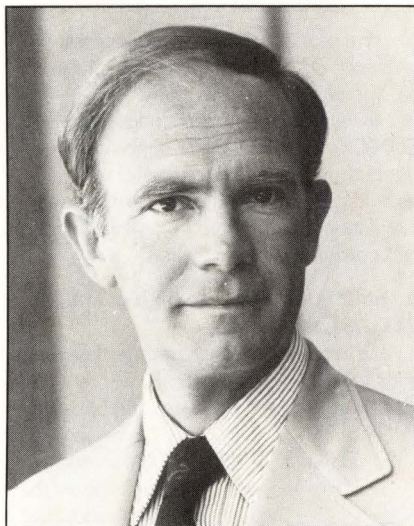
Information centers are cropping up throughout American corporations. And for every two information centers, there appears one resource center, according to William Sebrell, director of dp education for the Hartford (CT) Insurance Group. In terms of education, a resource center is to dp pros what the information center is to end users. The respective staffs at each center provide different kinds of training. Sebrell's resource center introduces programming-productivity tools to the company's programming staff.

According to Sebrell, more than the training has to be different in the two kinds of centers. There's also a need for different kinds of trainers.

Experience counts

"Everybody on my staff [which trains dp professionals] is a former dp-er," Sebrell says. "It's easier to take a dp-er and make him or her a trainer than to take a trainer and teach him or her dp. That's a hopeless task. Trainers tend to be from academic backgrounds, and academics don't work very well in the technical world. They don't know a thing about what goes on in the pit. Their approach to training is to change people's behavior, but we're not trying to change people's behavior. We're trying to give workers a bag of tools they can use whenever a problem arises.

"On the other hand," Sebrell concedes, "the technical trainers are probably the worst people in the world to teach computer literacy to end users. That's a different ball game. The dp trainer is used to teach-



"If you spend \$200,000 a year on training, then it makes sense to have someone managing that." *Brandt, Cdex*

ing you everything, the complete bag of tricks. End users don't want to know everything. They may just want to learn how to use a spreadsheet package."

Sharon Henry trains about 300 dp professionals at GPU Services Corp., a public utility in Reading, PA, where she is an education coordinator. She's familiar with the arguments over who's best qualified to train whom. "There's a lot of controversy over whether an educator or someone with a dp background makes a better trainer," Henry says. All of the trainers at GPU have worked in dp, and Henry feels that that experience is important. "If you're asked to find a programming course for someone," she explains, "and you don't know anything about programming, it's really tough for you to look at the courses on the market, evaluate them, and then select one that will be effective. I've been a programmer. If someone asks me for help in finding a new programming course, I understand what that person is looking for.

"The complaint you always hear is that dp professionals don't have good communications skills," Henry acknowledges. "Sure, I know technical people who are well versed in a particular language, but I wouldn't turn

them loose on a group of clerks."

Ron Rossi, another programmer-turned-trainer, is a technical-development manager for Manufacturers Hanover Trust in New York. If he doesn't feel his history as a programmer makes him a better trainer, he does believe it gives him an added perspective. "It gives me a point of view that someone without any dp experience doesn't have," Rossi says. "The nontechnical trainers judge everything on a different level. Where I look at the technical content of a course, they might look at its readability. They have to talk to the user a little more to find out if a course meets his or her need. I know how programmers think, so I know what they want. I can make a decision about a course on my own."

Yes, the head of training must be an evaluator, says Ed Yourdon, but also an administrator. Yourdon believes that the person who strikes that perfect balance is a rarity. "It's unreasonable to expect a training manager to be an expert in all technologies, and to be able to evaluate all training vendors."

Covering the basics

What the training manager must be is a trainer, and how he or she accomplishes that may very much depend on who's being trained, according to Naomi Estes. "There's not just one answer to the question 'Who makes the best training manager?'" she says. "If you're in an organization that needs an old coder, then the answer is yes to that. If you need someone who can go in and teach a course just to demonstrate the credibility of the training, then the answer is yes to that."

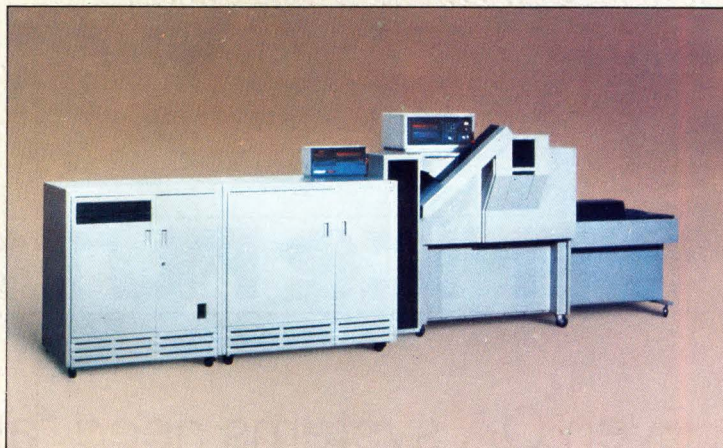
"Training is a service to the organization," says Ron Rossi, "so training managers should obviously be responsive to the employees they're serving. If they're not, it'll start showing up in their students' work. You have to listen to the people you're teaching and respond to them quickly enough to make sure everything's working for them." □

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OFFICE AUTOMATION

Even OA systems need "angels"

Many new Broadway shows need an "angel"—sometimes several of them—to get on their feet. Just in case you're unfamiliar with the term, angels are rich individuals who back a play financially without having any say in its production, direction, casting, or scripting. If the play is a hit, they reap financial rewards.

Office-automation projects should have angels, too. They are needed not only for financial support (although the ability to commit substantial corporate resources is important), but to sponsor the new system, lend credence to its usefulness. The more clout these people carry in their organizations, the better. Their support may extend from merely spreading favorable reports about the new system to working with it regularly. The OA-angels concept, along with several others about the implementation of OA projects, is put forth in "Managing the Acceptance of Office Systems," a recently published report from Input, the California-based market-research and consulting house.

Many times, executives responsible for implementing a new OA project will underestimate its scope, the report says. You should make sure the organization has sufficient resources—enough workstations and quality printers, for example—before implementation. Inadequate resources might inhibit use of the system and keep the project from getting off the ground.

Costs are often underestimated as well. But if the project starts off with enough good equipment already in place, you will be better able to identify and plan for the threshold at which costs will greatly increase. Ac-

cording to the report, this threshold is reached when the system becomes large enough to require additional processing power and storage.

Another important method for gauging costs, as well as potential problems, is the pilot project. The pilot user group should be visible to top managers (if the new system is effective, these managers will be in the best position to see that it proliferates) and should include enough users for a credible sampling. The group should have an acute need, such as improved communications, that the pilot system can satisfy.

Because costs are often high, and benefits are not immediately apparent, justifying the new system to those who will purchase and use it can be difficult. Some managers may see it as a high risk; others a fad.

The users, who may range from CEOs with executive information systems to clerks with word processors, may also find the system hard to accept. They may think that the technology will quickly become obsolete, or that they will receive inadequate support. Many may simply distrust the information-systems department, which will have a primary role in implementing the system; others may fear losing their jobs to the technology.

Promoting office systems in general throughout the company is a first step in heading off barriers to acceptance of the particular system you wish to install. This can be done, in part, by distributing newsletters chronicling the success of systems in other organizations. You should also demonstrate the system to managers and present user testimonials on its viability, ease of use, etc. Be careful not to oversell, however. Instilling un-

realistic expectations can lead to dissatisfaction and rejection when the system does not function as everyone expected it would.

Users' and managers' skepticism can be further diminished by the formation of a task force to direct implementation. According to the report, this group should comprise managers, finance personnel, users, and the information-systems department. Including both management and members of the finance department will improve users' understanding of the benefits of the system.

Proper preparation and training of users will also help knock down

Promoting office systems in general is a first step in heading off barriers to acceptance of a system.

barriers to the system's acceptance, the report states. To provide that preparation and training, the organization's information-systems department must assume the role of facilitator. It must help the users to help themselves. It must include them not only in implementation, but in the planning, development, and support stages. When the information-systems department successfully plays its role as facilitator, users will gain a sense of ownership of the system. Having users take on the responsibility of ownership is the key to acceptance of the system.

If you've mapped out your course carefully, paying attention to these simple guidelines, getting the system to fly should be a snap. But it still wouldn't hurt to have a highly placed angel flying along with it. □



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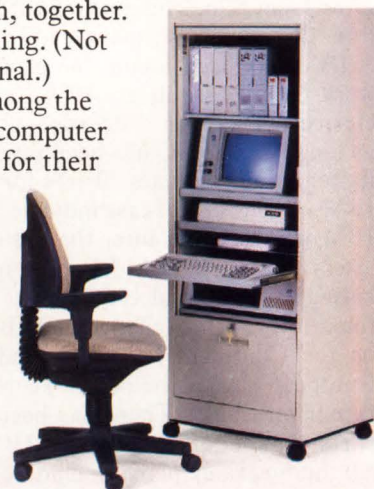
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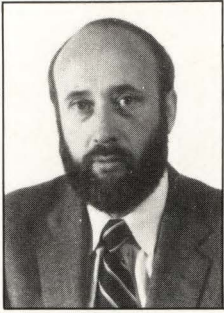
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by Michael Killen

FOLLOWING THE LEADERS

IBM elbows into communications

Nothing has fueled speculation about IBM's entry into telecommunications like the breakup of AT&T and the political climate favoring more competition. A hardware market that was a captive of AT&T's Western Electric (now part of AT&T Technologies) is now open to any vendor that can produce and deliver products to the seven regional operating companies. In addition, the Federal Communications Commission (FCC) has cleared away many former barriers to competition in telecommunications services.

The telecommunications market is gigantic, and that's why IBM wants a share of it. The domestic market for on-site telecommunications equipment will grow from \$2.36 billion this year to \$4.4 billion in 1988. The transmission-services market will grow from \$76.2 billion to \$105 billion during the same period.

IBM has been laying the groundwork for an assault on AT&T's exclusive market for a decade—about as long as the FCC has been revising its regulatory policies. Briefs for the IBM vs. Telex legal case indicate that IBM was ready to enter the business as early as 1980. IBM has been marketing the 3850 and 1750 private automatic branch exchanges (PABXs) on the Continent for years, and its European success helped to keep the rumor mill busy. There has been all sorts of speculation about IBM's communications plans, including reports that Big Blue was developing a PABX in a Raleigh, NC, facility.

The rumors, however, turned out

to be off the mark. IBM gained a toehold in the on-site telecommunications market not through an internal effort, but by buying a 15 percent stake—since raised to more than 20 percent—in Rolm Corp., the Santa Clara, CA, telecommunications-equipment manufacturer.

Although IBM is setting itself up to get into selling communications equipment to corporate America, its commitment to the domestic transmission market is much greater and more advanced. Big Blue's fledgling Information System Network (ISN), a timesharing and network service, has the potential to garner a major share of the market for enhanced transmission services. In addition, IBM owns a third of Satellite Business Systems Inc. (SBS).

For a manufacturer that strives to grow 15 percent a year, on-site communications equipment is a relatively small opportunity for growth. However, the market for transmission services is big enough to be important to IBM, especially because the fastest growth in that market will be in data communications.

IBM's stakes in Rolm and SBS, and its ISN division, are only three parts of Big Blue's communications strategy. I expect to see IBM both adding more parts to the puzzle and strengthening existing connections between the parts. One possibility is the acquisition of a network like Tymshare.

This year, I expect IBM to introduce a hierarchy of local-area networks (LANs) for data and voice

transmission. IBM will more closely couple the Rolm PABX and the PABXs of other manufacturers with its own terminals, workstations, and computers. I also expect IBM to announce a medium-speed token-passing network, as well as a high-capacity network using the same protocols.

It will take several years for IBM to realize its communications potential. Products will be released in the usual IBM manner—Big Blue will try to match demand with production capacity and protect existing products.

IBM's success in penetrating the telecommunications market will be enhanced by its approaching dominance in personal computers. AT&T doesn't have a similar base. By endowing its PC with Bell Labs' Unix operating system, IBM put itself in position to become the most important Unix vendor by the end of the year. By doing so, IBM could take control of Unix standards from AT&T. IBM's product, called CP/IX, is based on Unix Level III, but AT&T is trying to make Level V the Unix standard. The question of who sets Unix standards will be the backdrop for only one of the many battles IBM and AT&T are likely to fight during the decade, and the outcome may hint at which giant has strength enough to claim communications dominance. □

Michael Killen is president of Strategic Inc., a San Jose, CA, research house specializing in the computer, communications, and semiconductor markets.

NO DEC IS AN ISLAND.

Able's new Easyway/E Ethernet port controller makes tying together networks of UNIBUS PDP-11 and VAX computers easier than ever.

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What's more, Easyway/E meets IEEE 802.2, 802.3 and NBS-4 standards for ISO/OSI layers 1 thru 4, so current and future communications with other DEC systems will be smooth sailing.

In fact, Easyway/E's architecture is designed to accommodate future networking needs. The single board is comprised of two modules, so tomorrow's protocols can be implemented quickly with less expense. Additional protocol support including X.25, SNA and TCP/IP will soon be available, as will software support for DECnet and UNIX.

Able offers a broad range of devices for DEC computers providing communications, memory expansion and inter-processor connectivity. All complying with FCC regulations.

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by John Seaman, Data Communications Editor

DATA COMMUNICATIONS

Teleports: The urban alternative

Are you having trouble finding enough leased-line capacity to handle your intercity communications? If you're using a satellite carrier, are you plagued with interference and other last-mile problems? Then perhaps you should consider factoring the services of a teleport into your plans for the future.

Teleports serve much the same purpose for electronic information as seaports do for cargo borne by ships. They are central collection and distribution points for transmissions of voice, data, video, and other kinds of messages.

In every city in the nation, corporations with extensive information-transmission needs, such as stock-brokerage houses, banking and

insurance concerns, and broadcasters, need a wide range of communications capabilities. These information-intensive corporations need to access and communicate through satellites. But in many cities, satellite communications are hampered by busy airwaves. For example, Manhattan is overloaded with cable and microwave-radio traffic carrying the messages of thousands of users trying to access suburban earth stations. Experts believe that without teleports, service corporations will be forced to move out of Manhattan and urban centers like it to carry on the heavy load of high-speed data communications vital to their businesses.

One of the most forward-looking examples of this new approach to urban telecommunications is the

New York City Teleport, funded by public and private sources. The goal of the project is to provide the New York area with unimpeded access to satellites and ancillary facilities.

The heart of the teleport will be a farm of at least 17 satellite antennas on Staten Island, which lies in New York harbor between New York and New Jersey. The least-populated of New York's five boroughs, Staten Island is almost free of microwave and other interference. The antenna farm will be linked to offices in Manhattan and New Jersey by high-capacity, underground fiber-optic cables.

By 1985, the fiberoptic cable will be extended to as far away from the antenna farm as White Plains, NY, and Princeton, NJ, says Russ Romanelli, president of Merrill Lynch Telecommunications, a Merrill Lynch subsidiary and a backer of Teleport. That's a radius of 35 miles. "The fiberoptic cable will run right into end users' offices, or at minimum, very close to them," says Romanelli.

The new interest in teleports, much of it stimulated by the New York project, is a sign of the times. A city's telecommunications infrastructure is a critical factor in business siting and expansion decisions—as important as air, sea, and rail facilities were in an earlier era. This trend is evident not only in the interest in teleports, but also in the increasing number of office complexes being constructed with built-in communications facilities, including advanced private automatic branch exchanges, data-transmission cables, local-area networks, and rooftop satellite antennas.

Telecommunications, including data communications, represents an

(Continued on page 72)



The earth station of the Chicago Teleport is located in Skokie, IL, 10 miles removed from the interference-loaded airwaves of the Windy City. Signals are transmitted to the station via repeaters.

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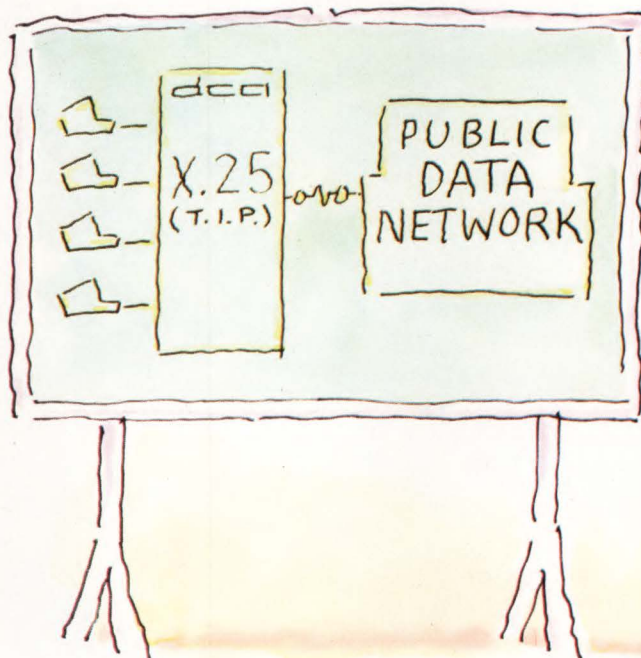
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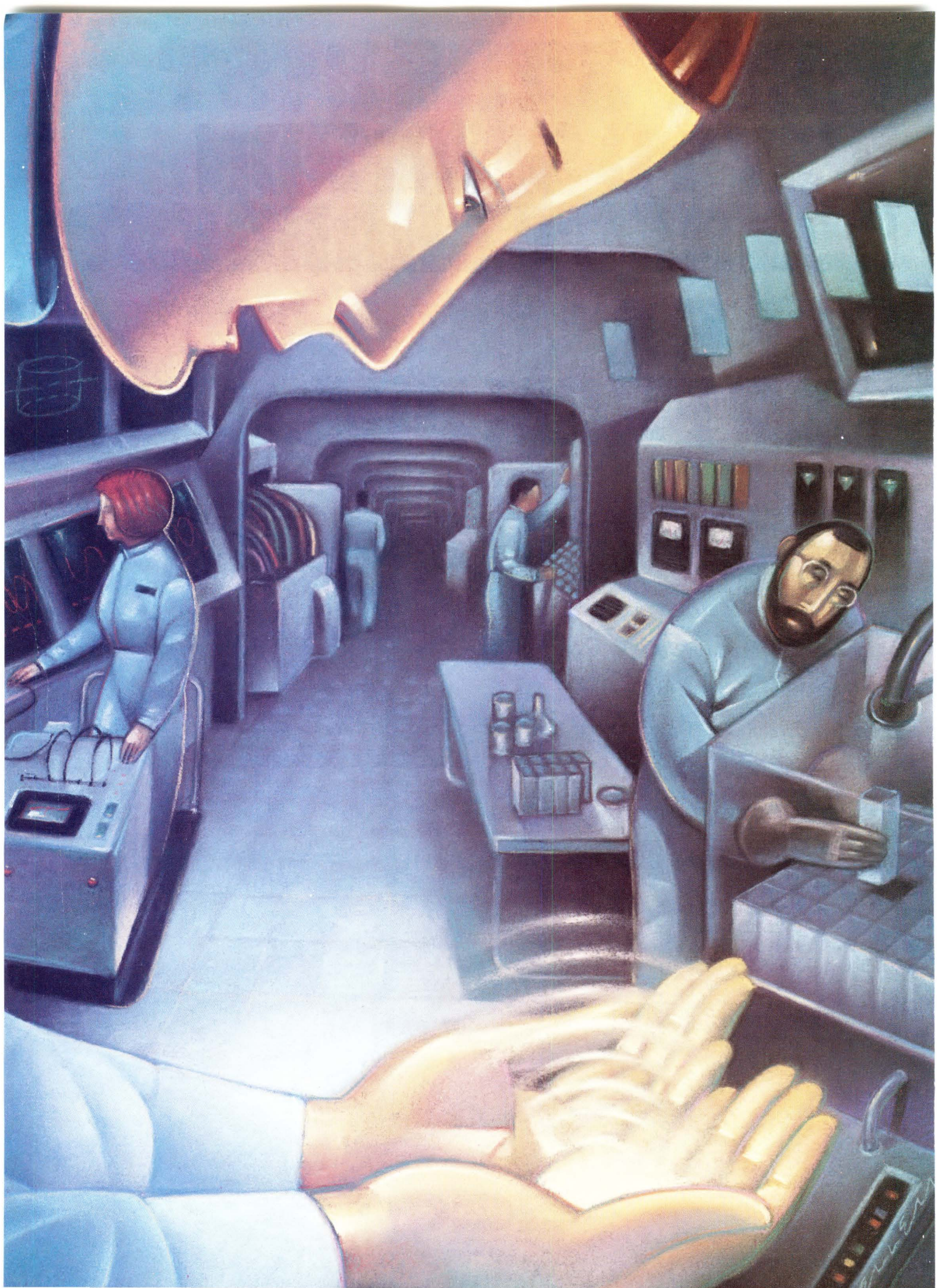
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As you read this, more than 150,000 Pennsylvania scientists and engineers are at work on nearly every facet of advanced technology. These scientists and engineers represent the second largest concentration of such professionals in the East. What's more, four of the top 50 research universities in the nation are here—more than in any other Eastern state.

But a program called the Ben Franklin Partnership is what puts Pennsylvania at the forefront of technological development.

The Ben Franklin Partnership combines the talents and resources of Pennsylvania's universities, businesses and state government to accelerate the development and marketing of new technology. The Ben Franklin Partnership provides matching funds for applied research through its four

advanced technology centers. It helps create programs for specialized work force training, and distributes seed grants to help small businesses grow.

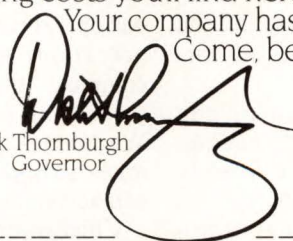
The Ben Franklin Partnership has developed an inventory of the research activity at Pennsylvania's universities and industries, and channels this information to private enterprise. And it can even provide incubator space for newly emerging companies.

Yet, as thorough as this partnership is, it lacks one essential element.

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DATA COMMUNICATIONS

(Continued from page 68)

ever-greater cost of doing business for service corporations. Analysts have estimated that the communications bill of Citicorp, owner of the world's largest bank, for example, is more than \$150 million a year. Until recently, telecommunications was conducted almost entirely by AT&T through its national network. However, the recent AT&T divestiture, coupled with the rise of alternative long-distance services, satellite links, and private microwave transmissions, has given organizations more options for getting the most from their communications budgets.

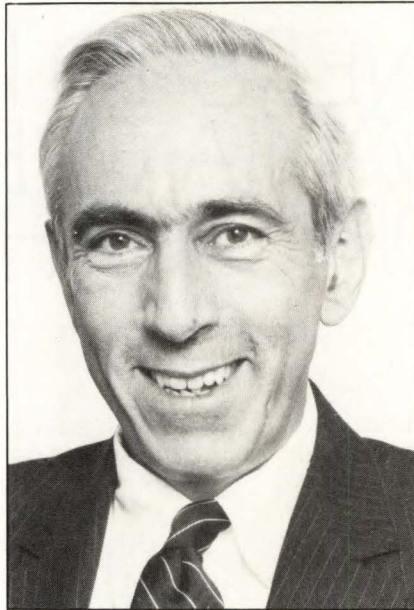
A look at the plans for the New York Teleport and the current applications of the Chicago and Washington facilities yields a picture of the services that will be available generally from these facilities. In addition to unimpeded satellite links, corporations can realize other benefits from teleport facilities as well. Teleports offer security and tight environmental controls for users' computers, switches, multiplexers, modems, and other sensitive equipment.

Teleport users will have access to local-telephone-company facilities and specialized common carriers, international record carriers, and the communications companies of foreign countries.

One popular application among teleport users is teleconferencing. Various organizations have already implemented teleconferencing via microwave runs to the suburban earth stations that are part of the Chicago and Washington teleports.

Biznet, a business-information operation of the U.S. Chamber of Commerce, runs one-way, full-motion, full-color teleconferences transmitted to as many as 105 stations. The conferences are augmented by two-way audio. Analog signals are transmitted from a 4-foot dish atop a building adjacent to the Chamber of Commerce headquarters in Washington via several relays to the Washington Teleport in Bryn Mawr, VA.

Biznet has contracted with the



"High-quality bypass will be one of the main advantages of the New York Teleport."

Romanelli, Merrill Lynch

Washington Teleport for a permanent local loop. "We bought into the Teleport in October 1982, when we built our own production facilities," says Doug Widner, Biznet's manager of network operations. "There were a few glitches caused by our operation's rapid growth. But our operations are now so varied and complex, it would be impossible to carry them out without the Teleport. We bounce from one project to another so quickly, only the Teleport can accommodate our needs."

Chicago-based American Hospital Association uses the Chicago Teleport for the same kind of teleconferences. AHA's local microwave loop begins with a 2-foot window dish in the association's downtown-Chicago headquarters penthouse. The signal travels 10 miles via repeaters to the Chicago Teleport's earth station in Skokie, IL.

AHA has used the facilities of the Chicago Teleport for about six years. Before that, it operated its own earth station and link to a commercial satellite from its convention centers in Anaheim, CA, and Atlanta. No microwave loop was required in that

arrangement—a 1,000-foot umbilical cable connected the convention floor to the earth station.

American Hospital Supply, a Fortune 500 hospital-equipment supplier headquartered in Chicago, conducts two-way interactive video teleconferences between just two sites using the Chicago Teleport. AHS transmits to the teleport via analog microwave at a cost of about \$1,000 per month, says Frank Kavenik, senior administrator. "Using satellite links provides us with greater versatility and cost-effectiveness," says Kavenik. "It's prohibitively expensive to use terrestrial links for the long haul. And the only simple, direct way to access the Teleport earth station is via its microwave bypass."

In the final analysis, transmission of video signals probably will not be the most important function of a teleport. Merrill Lynch, for one, hopes to realize substantial profits from selling New York Teleport services and capacity to other organizations.

Merrill Lynch currently buys transmission capacity from nearly every common carrier. "We buy a lot of capacity from MCI and American Satellite Co. for our remote sales offices, and from Western Union and New York Telephone for our Manhattan headquarters," says Stagg. "We hope to reduce these purchases when the fiberoptic teleport cable becomes operational late this year, but we will continue to look everywhere for reliability at low prices."

Merrill Lynch, like many other data-communications end users, is continually examining current technology. These companies are always looking for underutilized internal facilities and opportunities to cut costs by using innovative offerings. A corporation like Merrill Lynch has huge resources at its disposal—more than many other organizations. But its strategy is valid for all organizations. Whether they are giant, large, or small, organizations can benefit from the new opportunities—like teleports—to improve service and save money too. □

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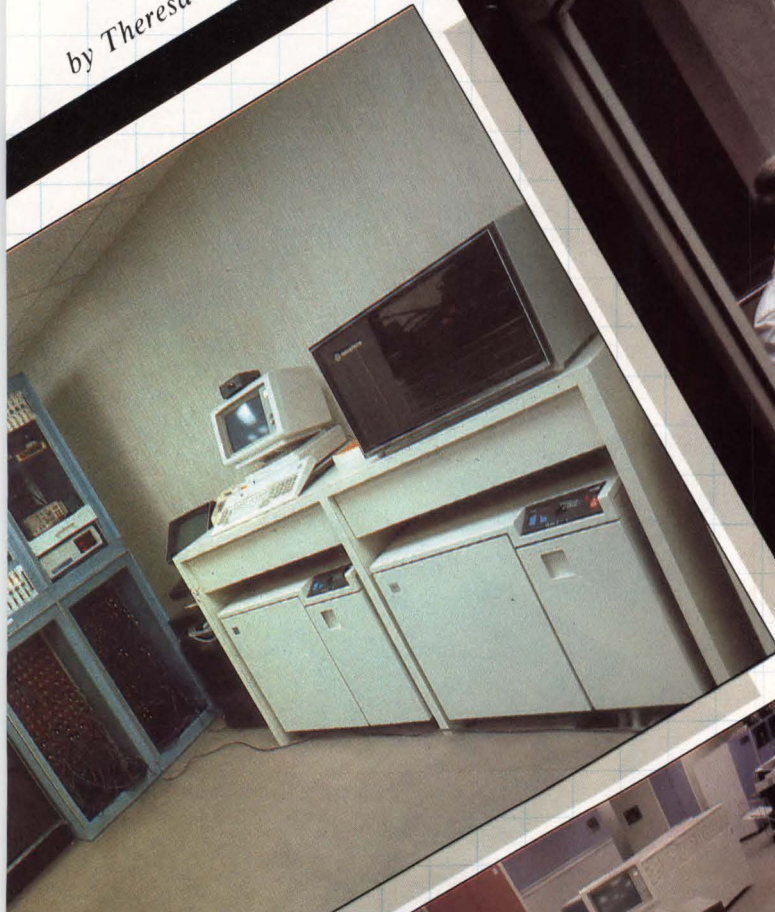
This is the first in a series of photographic tours of data centers distinguished for their high functionality, comfort, and appealing appearance. Designing and building a data center requires considerable planning and foresight. Certain requirements must be met before even attempting construction. The project can cost millions of dollars, and knowing how to get it right the first time can help hold the lid on costs. Here's one success story.

Employees of RMI, a manufacturer of titanium industrial products, moved into their new data center, located in Niles, OH, on April 7, 1982. Coates Construction

James Olsavsky, architect of RMI's data center, designed the exterior of the building (above) for more than its aesthetic beauty. The glass on the ground level, where the main computer center is located, is bulletproof. The reflective glass panels (right) are also energy efficient. In summer, the glass blocks some of the sun's heat, saving air-conditioning costs. In winter, the double-glazed panels block heat loss.

by Theresa Conlon, Staff Writer

Photos by Lynn Johnson



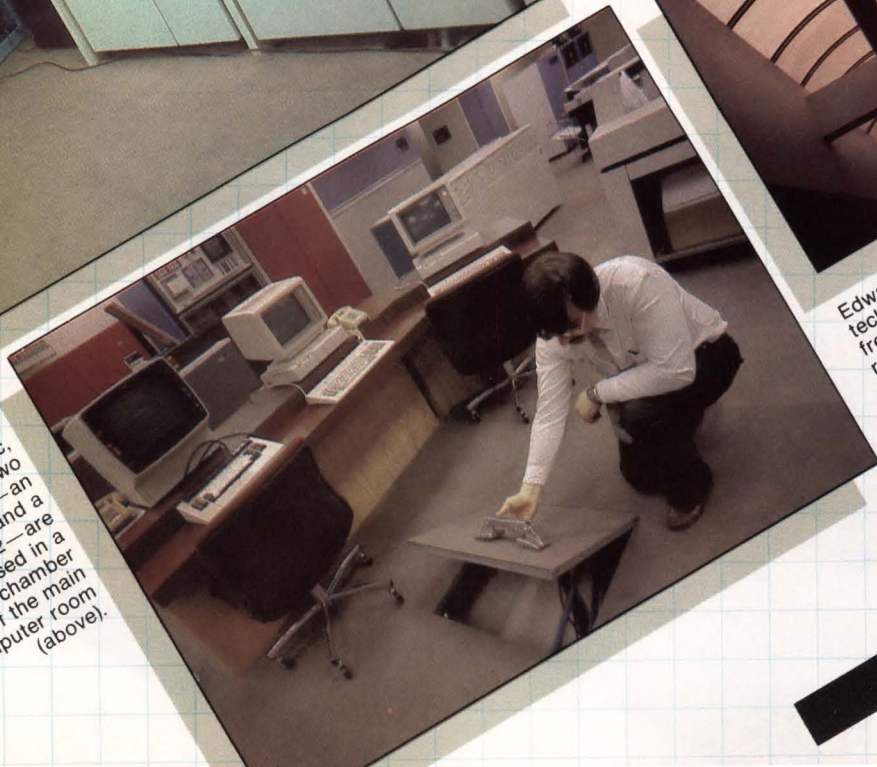
RMI's network control center, which manages nationwide traffic, and two computers—an IBM 4341-2 and a 4331-2—are housed in a separate chamber off the main computer room (above).



William Kress, supervisor of programming, and Randy Grego, applications programmer, confer in a Steelcase workstation (above). The glass enclosure lets them see the computer room, yet provides privacy.



Edward Detre (left), manager of technical support, demonstrates how a free-access floor in the computer room provides flexibility and easier maintenance. Wiring and cables are concealed beneath the surface to safeguard personnel and protect utility connections. Water and smoke sensors are also located under the floor. The data center features strategically placed skylights (above) to brighten the interior.

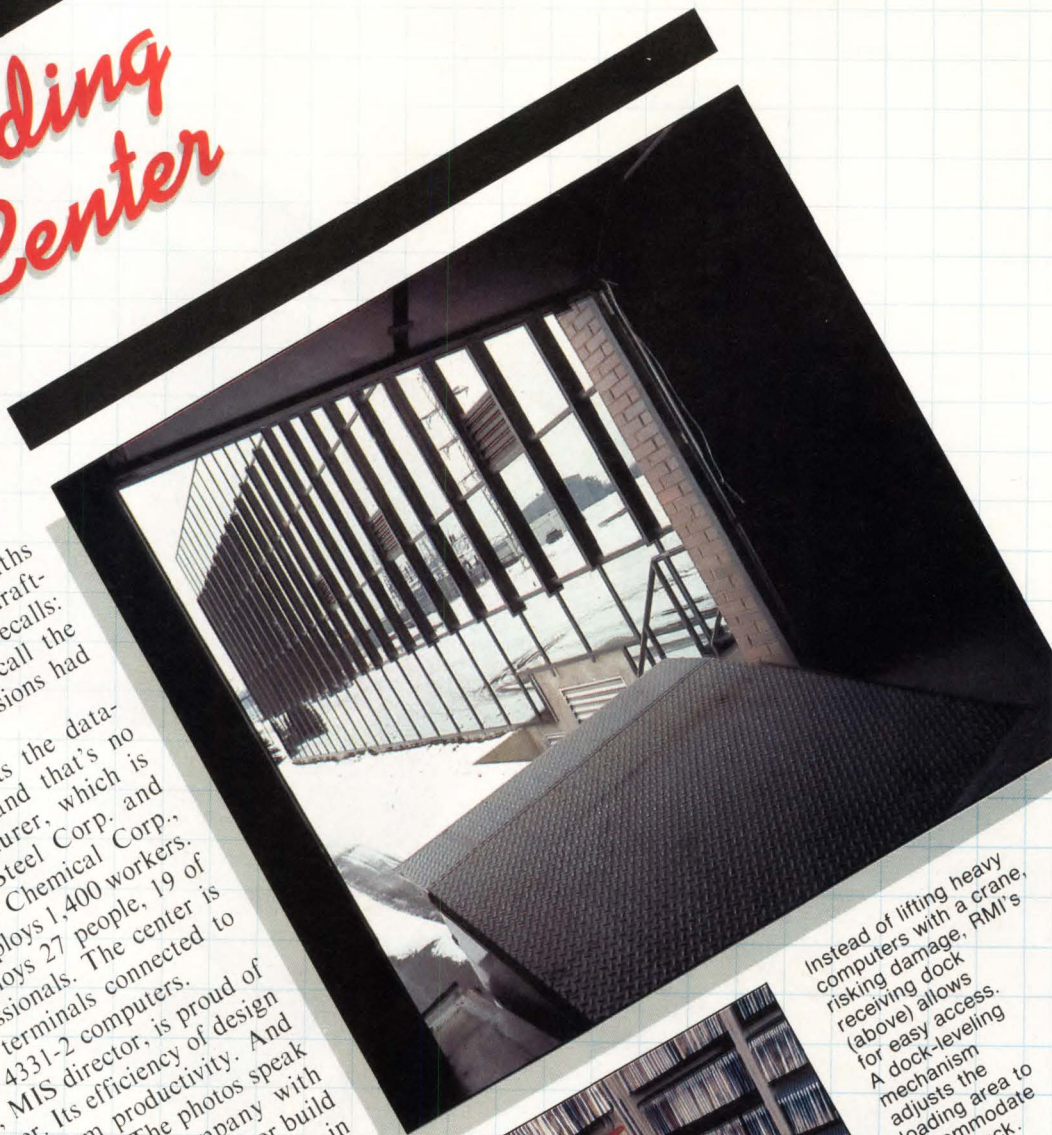


Outstanding Data Center

completed the building just 10 months after the architects finished the first drafting line. Architect James Olsavsky recalls: "We built RMI under what we call the 'fast-track system.' A lot of decisions had to be made in a short time."

RMI's data center supports the data-processing needs of RMI, and that's no small task. The manufacturer, which is jointly owned by U.S. Steel Corp. and National Distillers and Chemical Corp., has four plants and employs 1,400 workers. The data center employs 27 people, 19 of whom are dp professionals. The center is equipped with 31 terminals connected to IBM 4341-2 and 4331-2 computers. Frank Pilney, MIS director, is proud of RMI's data center. Its efficiency of design provides for maximum productivity. And its inviting appearance? The photos speak for themselves. . . . Any company with plans to either expand its dp center or build a new facility can find useful advice in RMI's pictorial. □

Rich, sturdy wood makes for a warm but efficient office. At right, Frank Pilney, director of MIS, and James Olsavsky, architect of the data center, discuss plans for RMI's future in Pilney's office.



Instead of lifting heavy computers with a crane, risking damage, RMI's receiving dock (above) allows for easy access. A dock-leveling mechanism adjusts the loading area to accommodate each truck.



A thick Diebold door secures the printout-tape storage vault (above) located off the main computer room. Two copies of every Cobol program are stored in this fireproof vault. A companion vault houses tapes.

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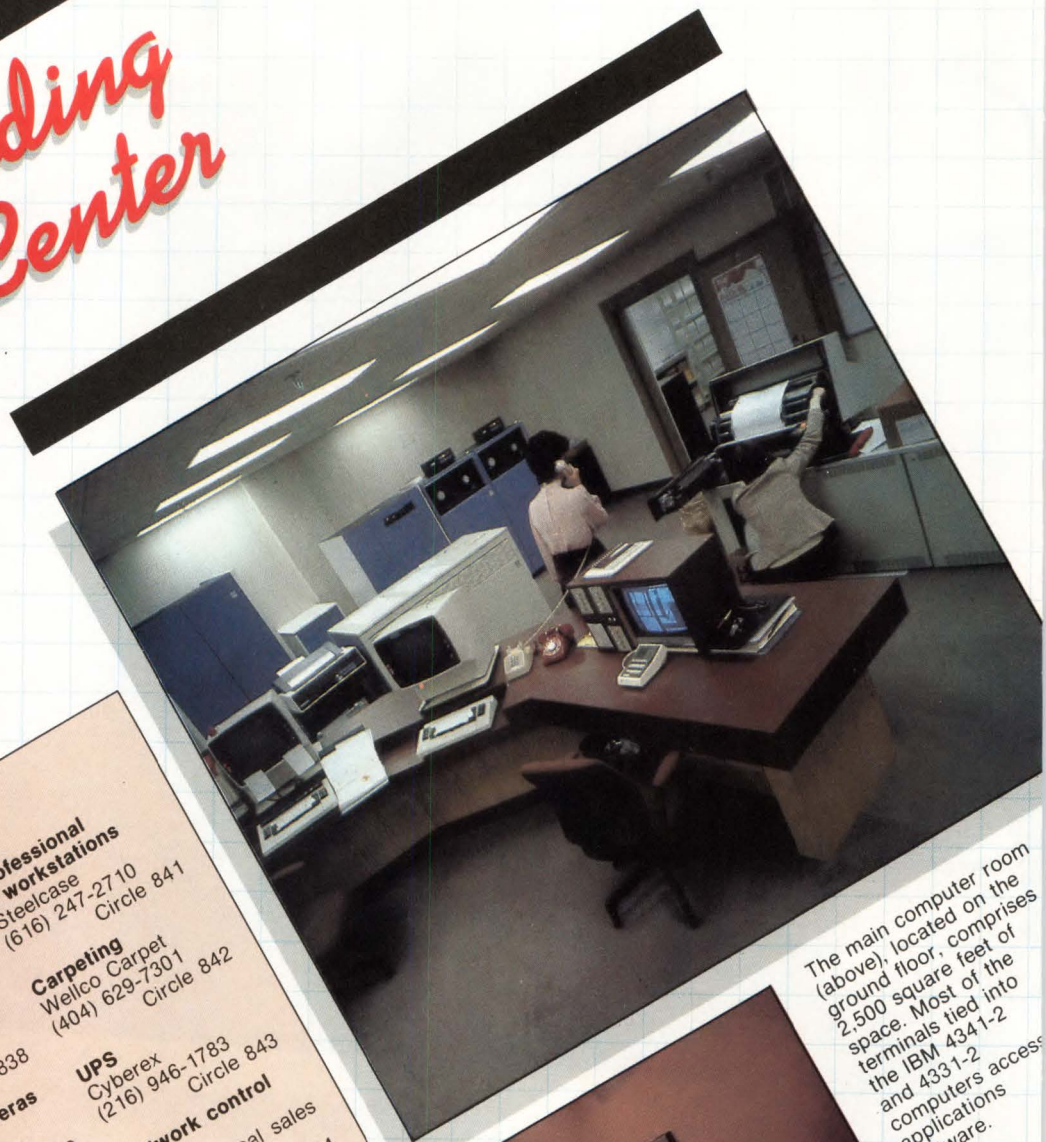
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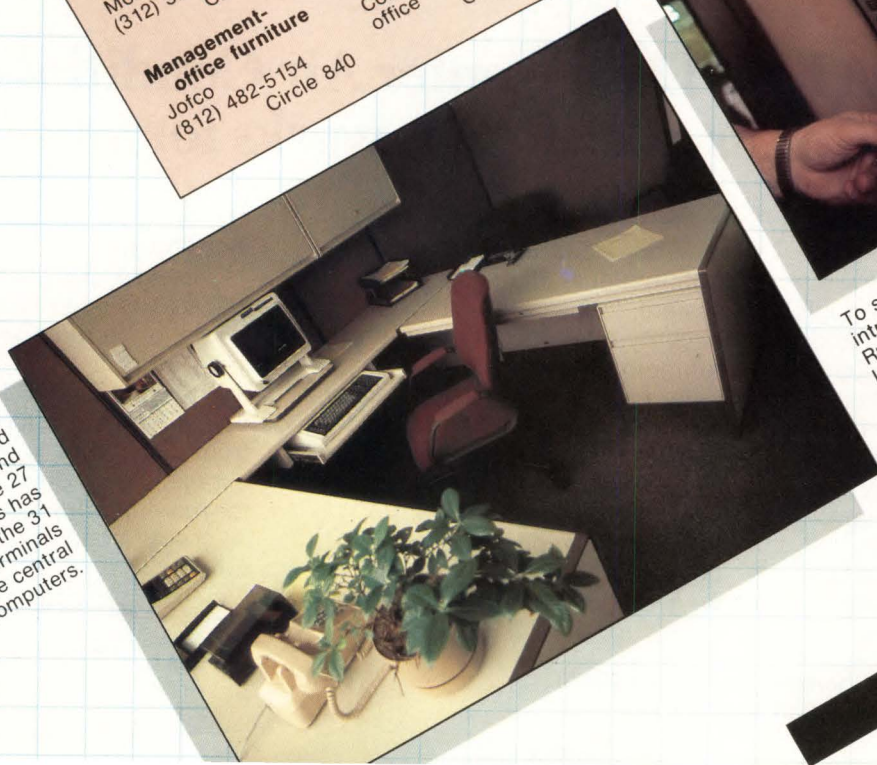


The main computer room (above), located on the ground floor, comprises 2,500 square feet of space. Most of the terminals tied into the IBM 4341-2 and 4331-2 computers access applications software.

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Attractive yet functional workstations by Steelcase are ergonomically engineered for comfort and efficiency. Each of the 27 data-center employees has access to one of the 31 video-display terminals connected to the central computers.



To secure the RMI facility against intruders or unauthorized personnel, a Rusco 500 security system, located at the main entrance, is programmed to allow access to employees with individualized entry cards. After inserting their cards, employees key in a password to open the door.

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CIRCLE 45



DO YOU TREAT WOMEN EMPLOYEES DIFFERENTLY...

To keep workers satisfied and productive, managers are revising traditional ways of treating female employees.

by Mary Miles, New England Editor

Mary Ellen Lewandowski is pregnant. A group engineering manager in the LSI Group at the Hudson, MA, plant of Digital Equipment Corp. (DEC), she'll return to her job after a couple months' maternity leave. What is remarkable about this is that it's not especially remarkable.

The first time she was expecting (son Brian is almost three), she worried about the effect her maternity leave would have on her career, but, she says, "I was flabbergasted at how much of a nonissue my pregnancy really was." DEC, for whom she has worked for 10 years, assured her that her job would be waiting when she returned. Indeed, Lewandowski found everyone—superiors, peers, subordinates—to be very supportive. "Colleagues treat me as if I were going on a long vacation, and this time there's no anxiety that I might not come back, because I've taken a leave before."

The gender-gap problem can be

loosely defined as encompassing the perplexities that exist at all levels because of the pressures to treat men and women on an equal basis in the workplace. Mary Ellen Lewandowski's story seems to indicate that that gap is narrowing. On the other hand, her perception that she is one of the lucky ones points up the changes that still need to be made.

New ways of thinking

Two particularly interesting aspects of Lewandowski's experience are that she has never been aware of any special treatment she's received during her career, even though she recognizes that there is a gender gap, and that the men she works with have been very open to her situation. "I had read you shouldn't bring pictures of your kids to work or talk about them a lot because people supposedly can't deal well with a manager who is also a mother. But when I came back from my first maternity leave, colleagues were excited and friendly. What particularly intrigued me was that some men would say things like,

'Gee, I'd never let my wife work if we had a baby at home!'" Rather than reflecting criticism of her, their desire to talk about her choice was their way of exploring new modes of thinking about women at work, Lewandowski believes.

"Beyond management's acknowledgment that women have babies and men don't, people don't need to be treated differently on the job because of their sex," she asserts. "But maternity leave is hardly preferential treatment. It would be great if fathers could take leave too!"

According to Teresa Kersten, a marketing consultant at SRI International, a think tank based in Menlo Park, CA, DEC's management of this very visible aspect of the gender gap reflects a growing trend toward accommodating the needs of all employees. Kersten explains, "Now that women are recognized as valuable assets, as well as known quantities, companies are beginning to show more flexibility toward all individuals who decide to have a child or need a more adaptable schedule to spend time with a spouse or family."

It's no longer unheard of for employees to seek, and even demand, this kind of flexibility from their em-



...FROM THE MEN?

ployers. Donna E. Shalala, president of Hunter College of the City University of New York, relates in an article in January's *Ms.* the story of a man she was interviewing for a job. "Look," he said, "I hope you're not one of those crazy women who work all the time, because my wife and I have a three-year-old, and I want reasonable hours to share in raising the kid." She hired him.

Behind such flexibility is the organization's assumption that in the long run it will pay off. The results of a recent Kersten study for SRI suggest, somewhat surprisingly, that most career women feel more positively about their work than do career men. A key change in attitude is found in the distinction between the words *career* and *job*. A career involves the personal perception of work as a chosen lifetime vocation rather than a necessary means of earning a living. More women are looking upon their work as careers; hence, the responses from "career women" in the SRI study came from a wide spectrum—waitresses and secretaries to managers, lawyers, and engineers. The study, Kersten says, identifies women as positive elements in the workforce and, thus, as a pool of talent that companies are increasingly willing to accommodate. The message is clear: To keep the workforce satisfied and productive and to avoid the loss of valued personnel, companies must revise traditional ways of managing employees, even if it means bending the old rules.

The new challenges

During the 1970s, the principle of economic equality, abetted by equal-rights legislation, set into motion a decade of access for women at work.

They began slowly to enter jobs and levels of authority traditionally held by men; their share of higher-paying jobs has increased somewhat. At the same time, however, their number has grown in the lowest-paying job classifications, such as data-entry, secretarial, and service occupations. This fact has not gone unnoticed by young women.

Young women are approaching their educations differently. According to the National Center for Education, the percentage of women receiving degrees in such traditionally male-dominated fields as business and management, engineering, and computer science is steadily rising. (See accompanying table.)

Women's presence in the workforce is being acknowledged by companies hungry for talent. "Traditionally nontechnical companies are opening their doors to women with technical backgrounds," says George Rossi, president of the Burlington, MA, office of Gilbert Tweed Associates, an executive-search firm based in New York. Career opportunities are blossoming, he says, in MIS/dp positions such as software-systems management, design engineering, field engineering, and systems management. Those who get such jobs are "right on the firing line," and, therefore, in good position to move upward in the organization.

"In careers that encompass the management and use of high-technology tools," Rossi continues, "the old resistance to women professionals is disappearing. People are sought, hired, and promoted strictly on the bases of their experience and abilities. This can't be explained simply as a response to federal equal-opportunity legislation. It may be that men in these industries are more aware, or maybe it's that companies are forced into this attitude because of the crying need for talent. But the times are changing. As you filter

more females into key jobs, you start to see more changes in attitudes."

Attitude—and practice, too? The days are gone when employers were required to provide a "ladies' lounge" for respite from rigors of the 9-to-5 world. Now managers must wrestle with the question of what is equal treatment. Is it possible, reasonable, or even advisable to treat men and women equally in all cases? Is bending the rules for women different than bending them for men?

From where he sits

Whether you think the gender gap is a yawning chasm or a shallow furrow, whether you give the idea credence or not even willing attention, depends on your personal point of view, the official (and unofficial) stance of your organization, and the makeup of your workforce. How you deal with it has as much to do with where you are in the organization as with your own management style, which pretty closely reflects your most deeply felt attitudes and beliefs.

Let's say you are a male under the age of 35 and on your way up the corporate ladder. Chances are you're inclined to accept women as equals in the workplace. You've rubbed shoulders with them in computer-science courses, maybe even played intramural softball with them, and competed with them for entry-level jobs. You, too, are part of the "you've-come-a-long-way-baby" generation. You may not be in a position of corporate power yet, but, if and when you get there, you won't be surprised to be in the company of women.

What if you are a top-level corporate executive? You are likely a male in your late 40s to early 60s. The weighty decisions that set policy for the organization are yours. Yours, too, is the difficult task of dealing with an increasingly restless and dramatically changing workforce in an unstable economy, as well as determining the course that will satisfy the demands of equal-opportunity legislation. You may be more comfortable

Managing Women Employees

(Continued from page 83)

opening real doors for women than opening corporate doors for them.

If you're somewhere in between these two examples, you are probably straddling the gender gap rather awkwardly. Armed with the aspirations, potential, and accumulating experience that you hope will propel you to the lofty echelons of corporate power, you are the one who has to implement decisions made at the top and deal with women in the workforce. Yours is the problem of how best to manage the gender gap.

If you are a woman, your view of the width and depth of the gender gap is also shaped by your age, your position in the organization, your aspirations, and your history. If you have never directly experienced a gender-gap problem, you are still aware that bias and discrimination exist, often in subtle and complex forms. Lynn Gilbert, a principal of Gilbert Tweed Assoc. in New York, points out that, even though women have made progress in the pursuit of equal rights in the workplace, language and attitude disparities still color perceptions of working women. "For example," she says, "if a man and a woman are pursuing their careers in exactly the same manner and are both very aggressive, she runs the greater risk of being considered offensive. Colleagues aren't as likely to describe a man's behavior as aggressive. Instead they'll say, 'Boy, that guy really knows how to go out and get business!'"

Yet, Gilbert believes, the resistance to women aiming at and moving into management positions is gradually decreasing. "There's a new generation of men who were raised and educated along with women. And middle managers tend to be more accepting because, for one thing, their wives may well be struggling in the workforce, too. As for the residual effects of past discrimination, I don't think we'll be rid of them for another generation or two."

Many organizations are putting more effort into managing human resources, says Phyllis Tama, a recruiter with Thorndike Deland Asso-



Employers should not make assumptions about women, such as that they are not mobile, are emotional, or lack career commitment.
Tama, Thorndike Deland

ciates, an executive-search company and management consultancy in New York. "They are addressing such issues as how to better develop management skills, how to teach employees, and, most important, how to help people realize their potential, to benefit the organization."

Maintaining that today's businesses have an important stake in the advancement of women, Tama offers five recommendations for employers:

- Be absolutely certain your company applies equal standards to both men and women.
- Never make assumptions about women, such as that they are not mobile, are emotional, or lack career commitment.
- Improve the quality of recruitment at the entry level and involve senior managers in the key task of campus recruitment.
- Better the image of your company and the field itself. Examine salary levels and working conditions. (See February's "Meeting the pay-equity challenge.")
- Recognize the importance to the company's future of a professional human-resources department that identifies and develops high-potential individuals, regardless of sex.

This is a tall order; the ideal ever

linguishes far from the real. But the question still remains—is there any need for women to be treated differently from men on the job? "Sometimes there are valid reasons for treating male and female employees differently," says Sidney Diamond, senior vice president at Puroator Courier (New Hyde Park, NY). "When you, as an MIS manager, are trying to raise up the brightest and best of your organization's employees, you come up against a critical obstacle—women don't have the network of professional contacts men have always had working for them. Anyone who wants to succeed must have some support from both outside the organization and higher levels within. Because very few women are in senior management, or even middle management, you often try to help establish a network for the young female up-and-comer."

Equal but different

Few women have the network that men have traditionally enjoyed and employed, agrees Ruth Rawa, manager of advanced semiconductor development at DEC (Maynard, MA). After working for almost 31 years, she should know. But Rawa does talk of the "new-girl network" that is emerging among women professionals, sometimes with the aid and encouragement of the male establishment and/or the organization, but increasingly driven by the women themselves. "There is an informal structure here, for example," says Rawa, "in which women will meet from time to time to see if we are holding our own, getting a fair share of the jobs that are open, and making progress."

In response to the question of whether a male co-worker might not be justified in a complaint that the woman was receiving preferential treatment, Sidney Diamond responded, "If a guy is fairly astute, he'll realize that he has access to some sort of old-boy network that the woman doesn't. If he persisted in complaining, I'd try to find out if I had, indeed, been evaluating them



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Managing Women Employees

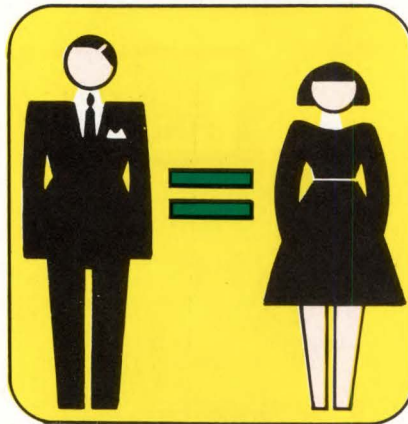
(Continued from page 84)

differently. If a man really needs it, he can be given the same kind of support."

Vicki McConnell, president of The McConnell Group, a Palos Verdes, CA, consultancy, suggests that much of the pressure on managers would be relieved if they would focus on what she describes as the real issue. "The real issue doesn't concern gender," she says. "It concerns *what employees need from you as a manager*. As a good manager, you're going to give your subordinates extra support, which some might mistakenly call preferential treatment, *if* they need it and *if* they're worthy of being brought along like that.

The bonus in boosting the strengths of subordinates—male and female—goes beyond making them more valuable to the organization. In business, you move ahead faster if you surround yourself with people who can contribute to your job achievement. When your employees do well, they make you look good, too. By enhancing the skills of your employees, you are in an important sense preparing for your own advancement. (See "Making it big," January.) Conversely, both you and the corporation will suffer if you deliberately or unwittingly fail to develop or use the talents of *all* your workers.

An especially thorny problem for



managers is that of coping effectively with the gender gap when the message from superiors is mixed. Occasionally, although corporate policy has been adjusted to align with equal-opportunity requirements and the official words are "fair play," corporate practice may be different. In an address last summer to a group called Women Educators in Independent School, author Gloria Steinem observed that there is still a strong tendency for leaders of organizations to retain the "clonal" habit of hiring or advancing people similar to themselves. Most of the people doing the hiring are men.

"Men who feel that a 'girl,' even though she is vice-presidential timber, is still a glorified secretary are a dying breed. But they are still out there, and many of them have high positions," adds Gilbert.

There are a lot of men with old-fashioned values in *not-so-top* positions, as well. How does an effective manager see to it that subordinates don't create abuses? Perhaps the best way is to set an example in both word and deed.

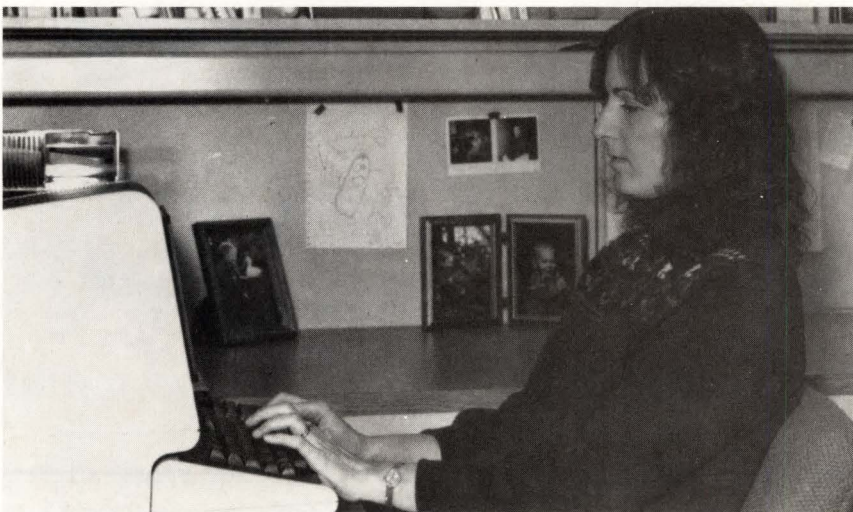
Even so, matters can get sticky if, for example, you have to deal with an employee who has been caught in the act of sexual harassment. In such situations of discrimination or abuse, management skills are truly tested because the response often leads to complex reactions on the part of the injured employee and other employees.

"Sure, the boss stuck up for me when he found out a couple guys were playing the fanny-patting game," says a division secretary. "But now everyone's self-conscious about how to treat me; some are angry and are calling me a whistle-blower. In a way, it's just as uncomfortable as when I was being harassed."

A more subtle and perhaps more pervasive manifestation of managerial double-talk occurs when women are promoted into jobs in what Marilyn Machlowitz, a New York management consultant, calls the "velvet ghetto." These jobs often have important-sounding titles, such as "user relations coordinator," "corporate affairs director," or "manager of public relations," but entail little real power.

The tip-off is that "women who are put into these jobs are given little freedom, few resources to work with, and few decision-making opportunities," says McConnell. Women channeled into jobs in the velvet ghetto, she continues, are just as much the victims of discrimination as those who are sexually harassed.

Not all organizations that assign and promote women to "comfortable and clean" jobs are guilty of deliberate discrimination, however. Sometimes such placement springs from a traditional (some would say "old-fashioned") protective instinct. "An overprotective attitude on the part of male bosses does capable women no favor," asserts Janice



Mary Ellen Lewandowski is on her second maternity leave from DEC. She expects to get back into the swing of her career shortly.



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Managing Women Employees

(Continued from page 86)

Miller, international president of Women in Information Processing (Washington). Women who are career-oriented feel special attention sells them short as productive employees, Miller adds.

The other, not so innocent, side to this coin is tokenism—putting someone in a job only to fulfill statistical requirements (or sometimes to deliberately prove that something can't be done). If you get promoted beyond what you're capable of, if you're forced into being a token, you're likely to fail, observes Mary Ellen Lewandowski. Such situations may be a manifestation of careless management, or they may be a knee-jerk reaction to pressure for equal rights in the workplace or to fear of litigation. For any reason, tokenism is bad business. A woman who knows or suspects she has been hired or promoted into a job primarily because she is female is likely to be dissatisfied on the job, lack motivation, and experience personal conflict about her role within the organization. The effect on productivity, morale, and stability is obviously negative.

Do women try harder?

Do women have to work harder to prove themselves at work? In a poll conducted by *The New York Times* and reported Dec. 4, 1983, 80 percent of the women and 68 percent of the men agreed that a woman must be better at what she does than a man. Performance pressure exists for everyone who has an eye on advancement, but many claim that women, unlike men, have to gain credibility all over again at each new level. "The higher up in the organization you get, the more of a problem you have," says Betty Niimi, general manager of the Intel database-management-systems division in Austin, TX. "When you've been at the forefront of a movement as I've been, you're always bumping your head at the top. There's a threshold at which you become the only woman in the crowd, as opposed to being one in a minority."

Elaine Bond agrees that women probably have to work harder and fail

less to get ahead. Senior vice president and top information-handling executive at Chase Manhattan Bank (New York), Bond says, "Pound for pound of skill, women who have achieved some kind of success today, who have had to push those limits, are probably more skilled than their male counterparts. They have to go that extra mile to be taken seriously, just to compete."

As to whether women should be managed the same as men or differently, Bond believes, "There has to be *conscientious*, as opposed to preferential, management. Until the culturally imposed biases about women's roles are worked off, a manager has to be sensitive to the potential



"Women just don't have the network men have traditionally had working for them," says Sidney Diamond, vice president of Purolator Courier.

inequities, including the right to fail."

Is the mentor or sponsor relationship, as many suggest, a viable way for a manager to give an employee that hoist up? "I am not of the school that believes in a single mentor relationship," says Bond, "because then the manager ties his or her particular success or failure to that of the employee, in addition to subjecting him or herself to the accusation of favoritism. It would be far more helpful to the employee if the role of advisor could be shared by a number of people higher up in the organization."

Evolution, if not downright revolu-

tion, is happening, says Ruth Rawa. "Organizations are beginning to perceive that there are highly educated, intelligent females available—women who are capable, dedicated, and hardworking. Organizations are asking, 'Why let that talent get away from us?'" As that talent gets used, she says, "size, shape, sex, and color" will matter less and less.

Michael Rottblatt, a vice president and partner in Korn/Ferry International (Stamford, CT), a large international executive-search firm, agrees. "Women may still have to work harder in some traditional arenas to demonstrate their expertise and get bosses to recognize them; in that regard, they are more driven. But that in itself is an important element of success—that burning desire to break out of a mold, the willingness to work hard to get what you want. Today, business needs independent thinkers, people who can look at a problem fresh and be prepared to give it an honest appraisal without being hung up on the way things used to be done. This ability is what separates the real go-getters, the risk-takers, from the pack."

Employees represent an important investment, says Rottblatt. "Any company that makes an investment and then doesn't work to get the highest return from it is not only shortsighted but is cheating itself."

In times when a survival ethic guides most corporate policy-making, denying any segment of the working population equal opportunities to achieve and to contribute to corporate well-being runs counter to smart business practice. Sensitive management of the gender gap promises much for many: motivation and job satisfaction for the employee; contribution to the productivity and potential of subordinates, as well advancement of his or her own career, for the manager; and a stable and smoothly functioning workforce for the organization. Clearly, the organizations that move first and fastest to shrink the gender gap will benefit most in the tough years ahead. □

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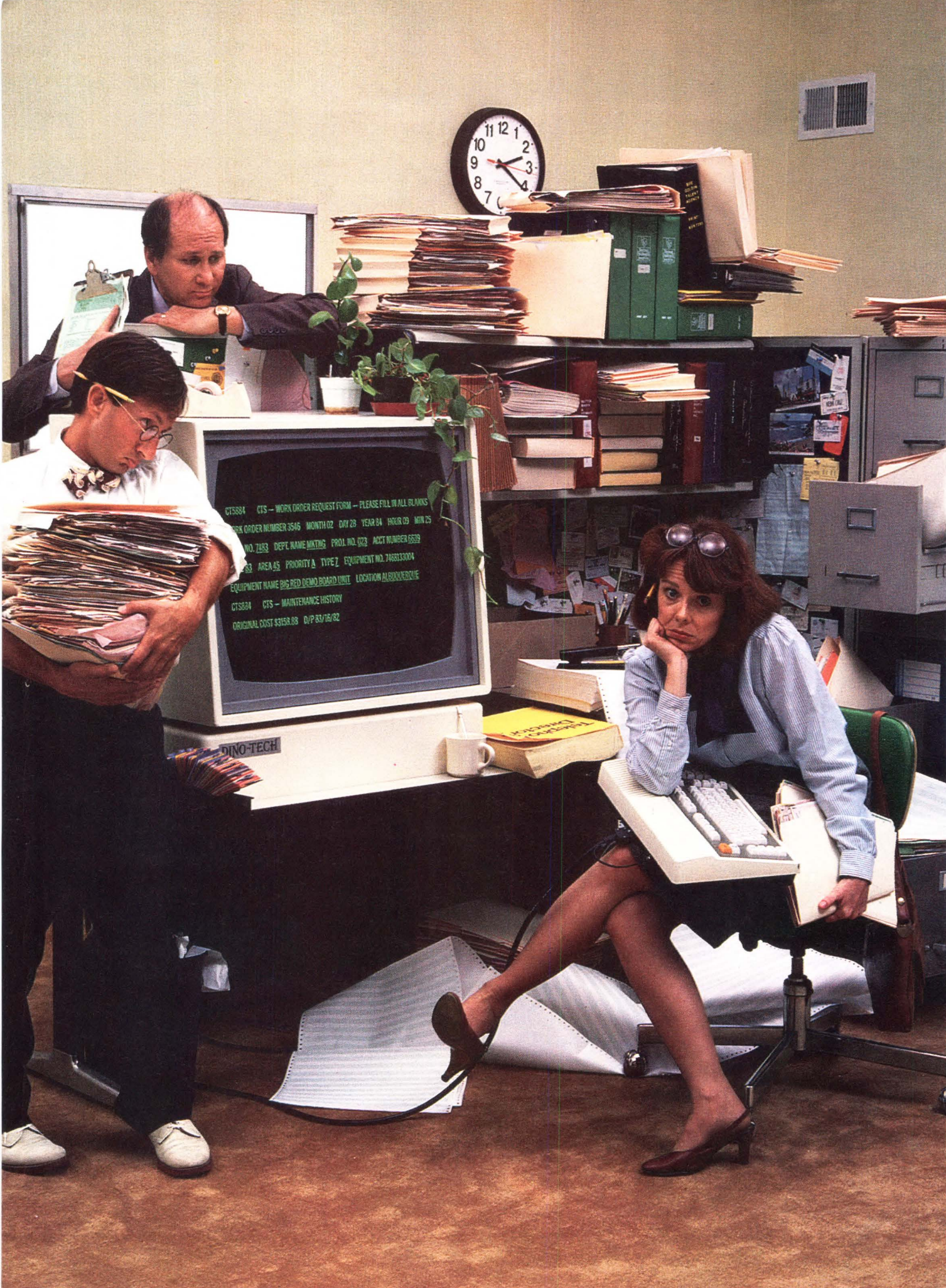
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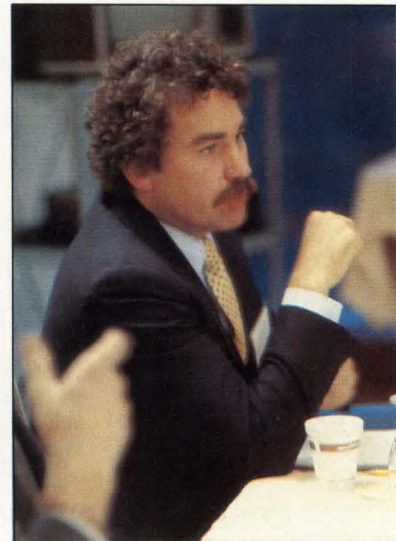
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LANs:

THE PROMISE AND THE PAYOFF

Second in the 1984 series of roundtables

Roundtable participants included (left to right) Ira Cotton, George Bazinet, Joseph McGrath, Henwell Chou, Mark Baron, and



As word processors and personal computers let more and more employees work with information in electronic form, an organization's ability to communicate electronically becomes more feasible and more valuable. Each electronic device can provide a transmitting and receiving terminal. Each electronic exchange can carry a benefit over traditional communications methods.

Computer Decisions recently invited a group of experts in connecting electronic devices to discuss how organizations can best take advantage of the opportunities presented by electronic information exchange. (See the box that accompanies this article for the list of participants' names and affiliations.) The experts

pointed out potential gains from local-area networks (LANs), which link information devices within office buildings, factories, or complexes. And they explored the difficulties of setting up such a network.

Question: Why are local-area networks important?

Ted Pearlman: The LAN will tie together the various information technologies in a corporation. Now we have traditional data-processing systems, information centers, and electronic mail. To be effective, we have to lash all that together in a meaningful way. The LAN will play an important role in that effort.

George Bazinet: It will be the vehicle for integrating personal computers, office systems, and mainframes.

Joseph McGrath: LANs should es-

tablish an architecture for linking information technologies. We want an architecture that will integrate the newer technologies—for voice, image, data, text, or whatever—as they develop. With an LAN, we can devise strategies for each of these technologies around a structure that was designed early on.

William Passas: The LAN won't necessarily be the main element in the integration of these services. The traditional star network, run by a host computer, will still be the hub of services, with LANs tying into it. But the LAN will be a cost-effective way to deliver information services over a local area, to each individual's desk. In wiring a building or small area, it's easier to run a cable along a corridor and tap into it than to run a separate line from a single source to each of-

Local-area networks can help a variety of information-handling devices communicate easily. But businesses must first sort through a collection of conflicting products and anticipate the twists of rapidly developing technologies.

by David Kull, Management Issues Editor

Ted Pearlman.



Photos by Bob Ward



fice. The LAN should also tie into a much larger network strategy.

Ira Cotton: Not everyone agrees on what constitutes an LAN. Organizations are looking for some ubiquitous communication system that can serve all conceivable needs. But it gets expensive to provide that diversity of functions. On a company-by-company, system-by-system basis, it may not be economical to integrate those services now. And yet, you don't want to make equipment decisions that will lock you out of the opportunity to integrate over the long term. Eventually, perhaps by the end of this decade, almost everyone will have an LAN and you'll be paying a premium for separate systems. But for the short term, there isn't any tremendous value in integrating for integration's sake.

Mark Baron: I'd like to be able to integrate communication of data from our mainframe and documents from our word-processing system. Unfortunately, the two systems are made by different vendors using incompatible technology. So we have different kinds of information available in many different locations. The only way we can move it around is by passing papers, which I find unacceptable.

Passas: In developing an insurance policy, most of the analysis is done on a dp system, while the actual contract is prepared on a word processor. We'd like to integrate the two processes. And we'd like to be able to send the information between widely separated offices. But most networks are designed to carry information only from mainframes.

McGrath: You're talking about inter-location communications. Warner-Lambert's studies indicate that 70 percent of its communications are within one building. LANs, PABXs [private automatic branch exchanges], information centers, or some hybrid will all help with communications within a building. But inter-location communications is a separate issue.

Henwell Chou: LANs are important for another reason: They permit resource sharing. As the number of personal-computer-based workstations increases, it becomes important for them to be able to share data storage, printers, and other fairly expensive or infrequently used peripherals. LANs provide a way for them to do that.

Travelers has set up small LANs in

LAN Roundtable

(Continued from page 93)

Mark Baron, William Passas, Ira Cotton, Henwell Chou, George Bazinet, and Joseph McGrath (left to right) discuss the



four of our smaller offices. Each connects six to 10 personal computers with a hard disk and printer.

Pearlman: What do those personal-computer networks cost?

Chou: About \$20,000.

Pearlman: And they serve only a small segment of your business—six to 10 users. That's a big price to pay.

Q: Do LANs provide enough benefits to justify such an investment?

Chou: Our networks are installed in financial-planning departments. The users have to do a lot of analyses on a lot of shared data. The only other way they could do this without actually carrying the information from one machine to another would be with terminals run off a mini-computer. Therefore, we feel the cost of the LANs is justified.

Cotton: You may be able to justify an LAN simply as a replacement for an existing communications system. But it may make more sense to look at the LAN as part of a comprehensive office-automation system. Then you have to consider the productivity benefits.

McGrath: We installed Ethernet as a pilot project in my department, office systems and services, just over a year ago. We did it not as an experiment

with LANs, but as an experiment in professional productivity. We studied our workflow for about six months before turning on the system, and looked at operations again after we had the system's data-sharing and electronic-mail capabilities. We found that we were getting the work out faster and better.

One task we perform is the evaluation of office equipment. The system let our personnel share files on the analyses and organized our recommendation-review cycle. Proposal documents made the rounds of participants faster and cleaner than they did manually. We cut the number of steps required to produce our reports by 40 percent. We reduced the time required for each by 32 percent. And we began handling 27 percent more requests for evaluations. Our department's results may not be projectable to the entire corporation. Still, they encouraged us to extend the system to two other departments—public affairs and human resources.

Cotton: I've advised on some government defense projects that have committed to LANs on almost a cost-be-damned basis. The organizers say, "We need the functionality. We have

to provide analysts universal access to a range of resources, and we'll be working at various locations." So, the same kind of impetus that led to packet switching and Arpanet years ago is leading to fully wired buildings in selected government R&D centers today. The U.S. Navy, for example, has been installing a comprehensive LAN at research locations in White Oak, MD, and Dahlgren, VA, with a T-1 [high speed] link between them. But not very many other organizations are committing themselves to large-scale LANs now.

A lot of pilot projects are aimed at figuring out just where LANs fit in. Many observers are waiting for IBM to introduce its LAN and expecting a shakeout of vendors after that. No one wants to be tied to a vendor that gets shaken out, so there's some value in procrastination.

Q: What kinds of problems can an organization solve with an LAN?

Pearlman: If you're at one end of a building and want to talk with someone at the other end, you get on the phone. An LAN should provide a way to do the same thing with data—text, computer data, or whatever. In most organizations, you can't do that—so you generate a lot of paper.

advantages of LANs.



Baron: We process a staggering amount of paper. Getting some of that information into terminals and getting users to read it is a first step.

Passas: AFIA Worldwide Insurance operates in 85 countries. Our only product is a policy that assumes the customer's risk. In effect, our business is information.

The LAN is part of our system for moving that information from one place in the world to another without changing its format. We used to move it manually. A secretary would type the information, make a copy, and carry it to the telex room, where another clerical worker would type it again and send it to a printer somewhere else. Now we tie word processing into our worldwide network and transmit the information from the source, without having to retype it or change communication modes. In some locations, typewriters are still used. However, the extra clerical process is eliminated, and facsimile, which puts the information into digital form for the network, is used instead. We've been able to cut down the time it takes to put out a policy from about two weeks to two days. But getting the information into the worldwide network is the key factor.

If we could only communicate with each other within one building, we wouldn't sell a single policy.

Bazinet: Within buildings, we're running into the need to transmit a tremendous volume of information because of the proliferation of personal computers. We're already seeing problems with personal computers attached to IBM 3274 cluster controllers. With their downloading and uploading of files and the sheer volume of information, they're knocking other 3270 users out of the

control unit. Then there's the issue of backing up data from the personal computers—particularly those with hard disks. We need to back up to a host computer, and we need to do it quickly, not at 9,600 baud. LANs will help solve these problems.

Passas: When you put personal-computer users on a network, though, they ask for data from the corporate mainframe. And if you don't tie those computers into your data network, you're not going to accomplish much.

(Continued on page 96)

Roundtable participants

Moderator: David Kull, management issues editor, assisted by Mel Mandell, editor, *Computer Decisions*.

Mark Baron, manager, technical planning, Witco Chemical Corp., Woodcliff Lake, NJ.

George Bazinet, manager, office systems, American Can Co., Greenwich, CT.

Henwell Chou, director, data processing, Travelers Insurance Co., Hartford, CT.

Ira Cotton, consultant, Booz, Allen & Hamilton, Bethesda, MD.

Joseph McGrath, manager, office systems and services, Warner-Lambert Co., Morris Plains, NJ.

William Passas, vice president, MIS, AFIA Worldwide Insurance, Wayne, NJ.

Ted Pearlman, director, MIS, CBS Toy Division, Secaucus, NJ.

LAN Roundtable

(Continued from page 95)

Pearlman: Then there's the problem of moving terminals. If you must hire an electrician to run a cable, you'll wait at least a month and pay exorbitant rates. It's difficult to explain the delay to the user who's waiting for a new terminal.

McGrath: We recently moved a terminal into a new employee's office. With Ethernet, it took two days. Because the network cable ran throughout our section of the building, it was easy to do. The job would have taken even less time, but we had to wait for an in-house electrician to do it.

Passas: When we renovated one of our buildings, we ran coaxial cable through every office, within the partitions and ceilings. We could either have done it during construction or retrofit later. It was clear that doing it at the start would be much more effective.

Baron: We prewired the MIS department in our new building. It would have cost about five or six times as much to add wiring after the floors, walls, and carpeting were installed.

Cotton: You don't even have to put in the cable as long as you put in the conduit for it. You don't have to plan on the kind of cable, either—broadband, baseband, or fiber optic. But you should plan for plenty of conduit. We advise clients designing new facilities to provide cable access to every area.

Passas: There are a lot of conduits in buildings that are filled up with AT&T cable. If new LANs require a different wiring scheme, someone will have the job of pulling all that cable out. That should be interesting.

Cotton: There are several other wiring issues to consider. I've seen companies pull PVC [polyvinylchloride] cable through false ceilings—a violation of fire codes in some circumstances.

Baron: The alternative, teflon-jacketed cable, costs about three times as much as the PVC. And electricians don't like it because it doesn't bend easily.

Passas: You also have choices to make in running wire from floor to floor. We occupy two floors in a

building—the 18th and 26th. We could run either individual wires between the floors or a large cable containing many wires.

Pearlman: Or you could use a single small wire and branch off a data concentrator.

Passas: We considered that, too, but chose the cable because it was most cost-effective.

"In a few years, we'll see the interfaces for popular networks on \$20 silicon chips."

Cotton, Booz, Allen & Hamilton

Q: Given the wiring, how easy is it to hook up machines that can talk with each other?

Bazin: You can make almost any machine talk with any other. The question is: How long does it take to make them compatible?

Passas: Transmitting the data be-

(Continued on page 104)

A sampling of LAN manufacturers

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Syst.
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Circle 636

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(214) 783-0993
Circle 664

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Electronics
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Circle 643

Intersil Syst.
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Circle 648

Prime Computer
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Circle 651

Apollo Computer
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Circle 638

Concord Data Syst.
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Circle 657

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Microsystems
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Circle 644

M/A-COM Linkabit
(619) 457-2340
Circle 659

Racal-Milgo
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Circle 652

AT&T Information
Syst.
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Circle 637

Contel Information
Syst.
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IBM
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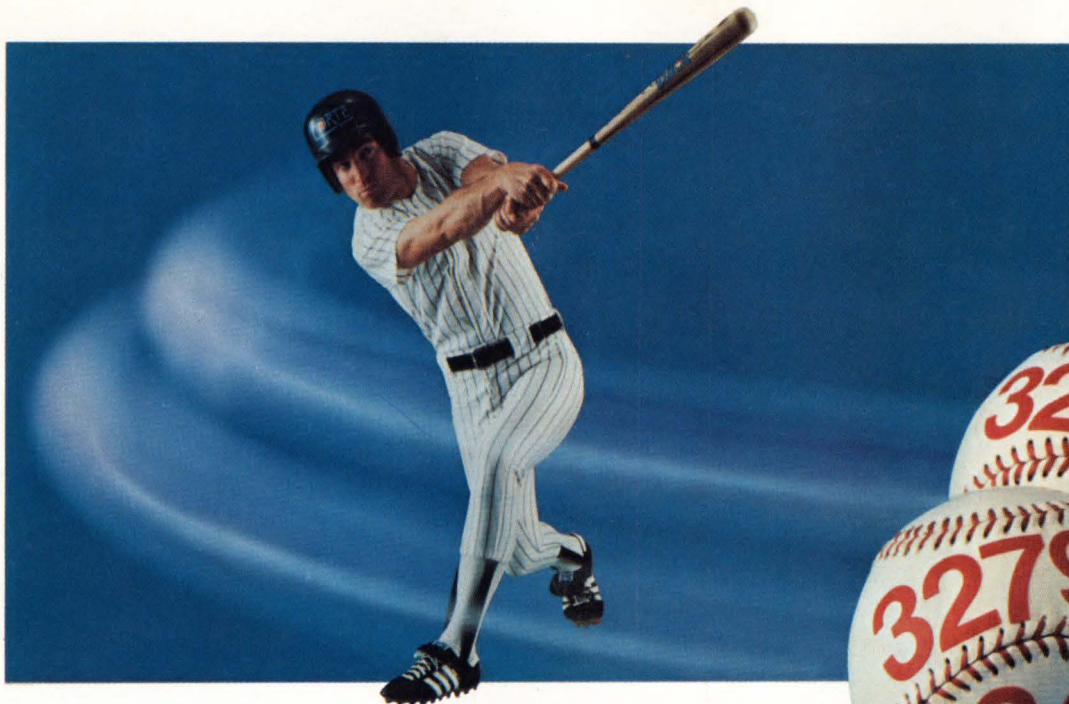
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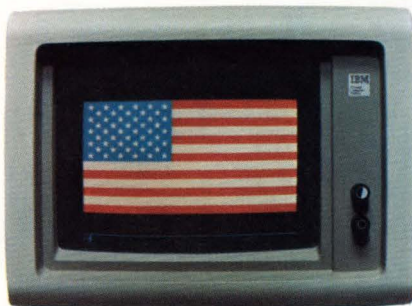
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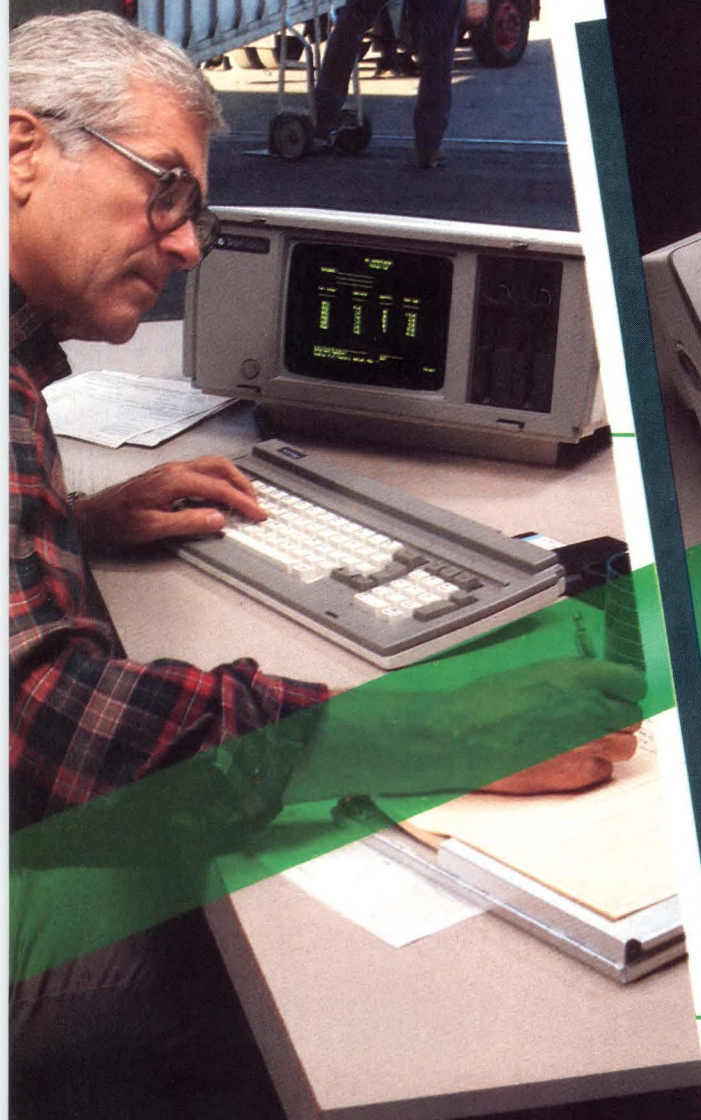
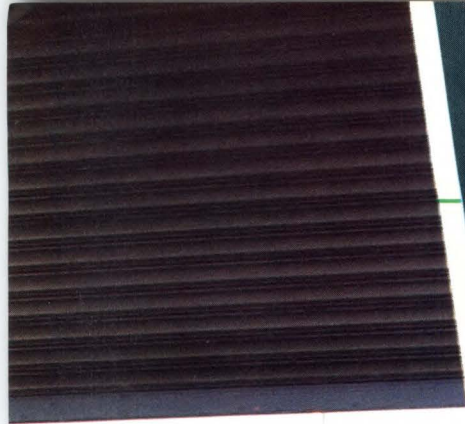
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In May *Computer Decisions*

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CIRCLE 53

LAN Roundtable

(Continued from page 96)

tween most machines is easy, but the information may not make sense. In word processing, for example, the screen, line-feed, paging, and other formatting codes may not be the same for one machine as for another. You can move the information between them, but you can't play it back.

Bazinet: DEC chose Xerox' Ethernet for connecting its minicomputers and personal computers. But if you were to put Xerox and DEC products on

"We're not going to see any real standards in LANs until one vendor wins a substantial market share."

Bazinet, American Can

the same Ethernet, Xerox machines could talk to Xerox machines, and DEC machines could talk to DEC

machines, but Xerox and DEC machines could not talk to each other. That's because DEC makes its products compatible with Ethernet only at the lower levels of the International Standards Organization network model.

McGrath: There are commercially available translators or protocol converters that can provide a degree of compatibility between devices—change a tab code from one machine's protocol to another's, for example. But you can't move functionality from one machine to another, and that's one of the real problems.

Bazinet: Some vendors say they'll support IBM's document-content and -interchange architectures. Their machines will be able to transmit documents between each other and IBM systems. That will be a de facto standard.

McGrath: Again, there's the problem of functionality. These architectures

are written for the least functional devices. We lose the capabilities of the higher-level machines.

Bazinet: We're not going to see any

"If you don't tie personal computers into your data network, you won't accomplish much."

Passas, AFIA Worldwide Insurance

real standards in LANs until one vendor wins a substantial share of the market. We saw that with mainframes and we're seeing it with personal computers now. Once a de facto standard emerges from the dominant vendor, other manufacturers will begin competing on the basis of price, like the plug-compatible-mainframe companies.

Q: Are there worthwhile alternatives to LANs?

(Continued on page 107)

Who Are **The Top 100 In Dp?**

You'll Find Out In June *Computer Decisions*

Prepared by the industry's leading analysts—the Gartner Group—this feature will be a special pull-out supplement bound into the magazine.

Readers will find out more about the companies they're buying from ... or should be buying from, when we reveal the answers to these and other questions:

- * Who are the top 100 vendors?
- * Which are the top 20 in revenue growth?
- * What are the industry trends?
- * How is the future shaping up for dp?
- * What does it all mean for the end-user?

Advertisers will want to reserve space in this special supplement! Readers will want to save it for future reference!

Don't Miss **The Top 100 In Dp ... Coming in June**
Top 100 Supplement Closes April 13
June Issue Closes April 27

New from Interactive Systems/3M:

The first high-speed broadband local-area network that guards against data crashes.

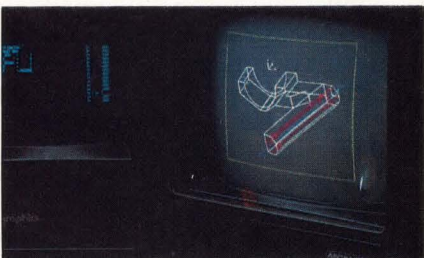
If you've been thinking of investing in a contention network, consider this: How do you guard against data crashes during times of heavy system use?

Answer: You don't, because contention schemes simply don't provide any kind of data insurance.

Fortunately, there is a new type of network that *does* protect against data loss. It's called 3M Videodata® LAN/1. And it's the first intelligent broadband local-area network that's designed to get data through on time, no matter how much traffic is on the cable.

Videodata® LAN/1: The efficiency of token-passing plus the proven flexibility and expandability of broadband.

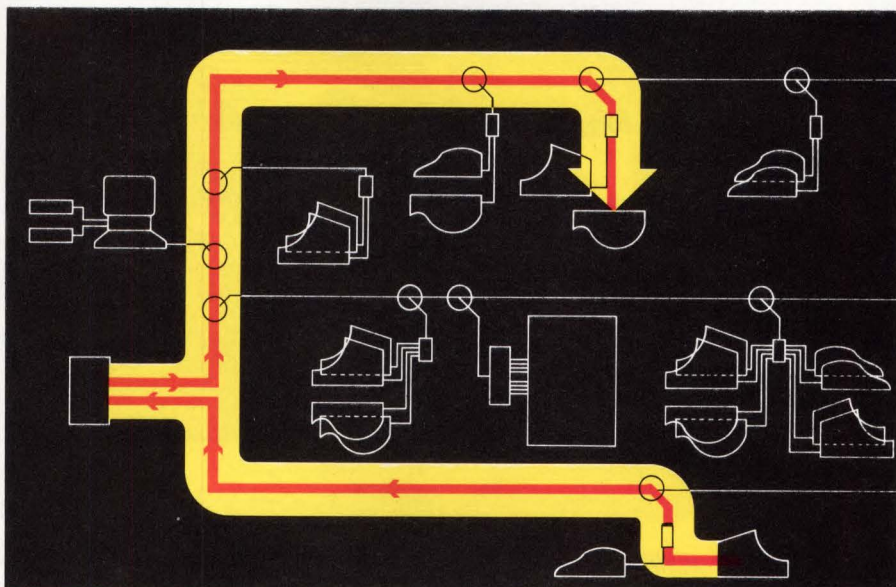
Token-passing networks eliminate contention troubles and data crashes by passing an electronic "token" from terminal to terminal. When a terminal has to transmit, it grabs the token and sends data packets to the receiving device. Receipt is acknowledged and the token is automatically released to continue its rounds. Because the system assigns a network entry address to each user, everyone has an opportunity to send data during each token cycle.



Because Videodata LAN/1 is a broadband system, dedicated channels can be used for full-motion video applications such as CAD/CAM and teleconferencing. These video signals are kept entirely separate from digital traffic on the network's token-passing channels.

So far, so good. But most token-passing networks are baseband systems, meaning that terminals must share a common channel as they would in a typical contention network. This can limit speed and capacity in some applications.

LAN/1 overcomes this possible limitation by combining token-passing with a proven *broadband*



In the Videodata LAN/1 network, messages can be sent from any terminal to any other without going through the host processor. Network Interface Units (NIUs) connect digital devices to mechanical taps (shown as small circles) on the main coaxial cable. A Network Monitoring Unit, or NMU, keeps a statistical record of network performance.

technology that allows many channels to be put on a single cable. The payoff: higher channel speeds, ranging up to 2.5 MB/s over a maximum seven-mile radius, with terminal data rates of up to 19.2 KB/s. Plus a capacity of up to 10,000 devices to allow plenty of room for future expansion.

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Separate channels for voice, video, and graphics. Plus the ability to work in point-to-point applications.

Because LAN/1 is a broadband network, channels can be set aside for real-time voice, video, and high-speed graphics. This can be done without compromising digital traffic capacity.

LAN/1's broadband design also permits flexibility in network architecture, so that it can be used in high-speed point-to-point applica-

tions which can't be served efficiently with contention systems.

Other benefits include full transparency, an automatic shut-off feature to keep any one terminal from capturing the token, and compatibility with both dumb and intelligent terminals. The list of features goes on and on.

For the full story on the new Videodata LAN/1 network from Interactive Systems/3M, call 800-328-1684 toll free. (In Minnesota, 800-792-1072.) Or mail the coupon.

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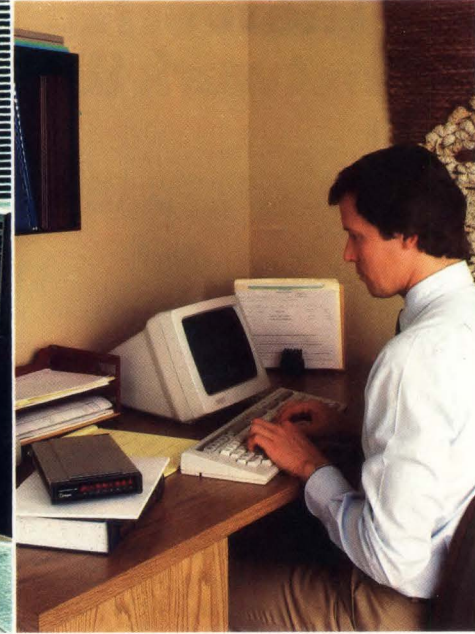
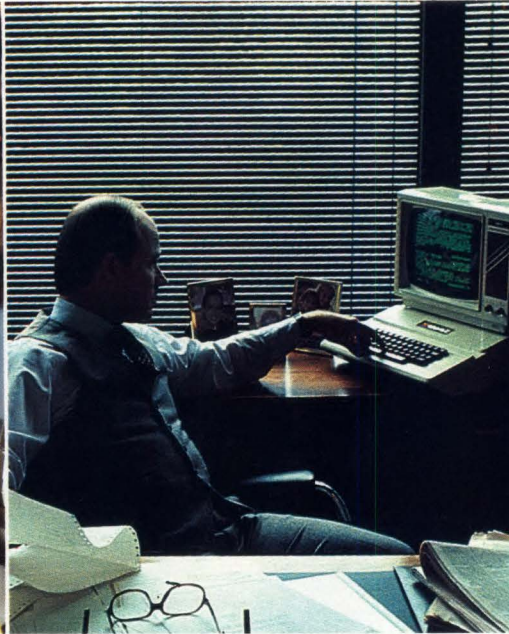
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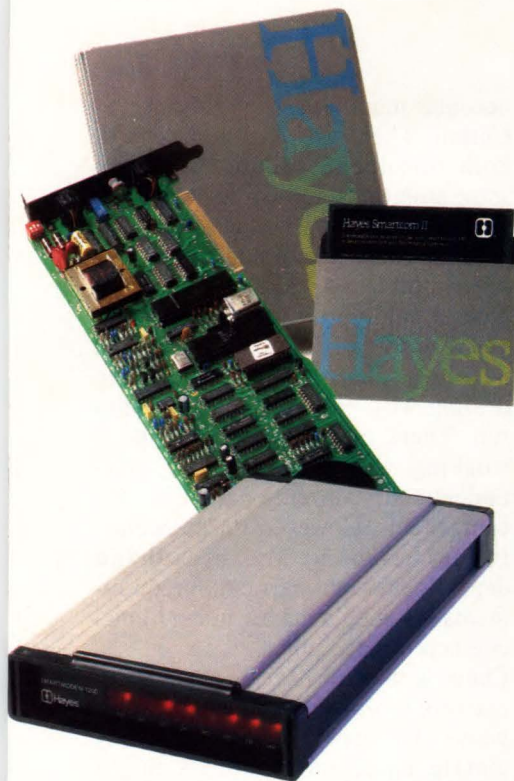
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Smartcom II communications software, currently available for IBM PC, DEC Rainbow 100, Xerox 820-II and Kaypro II.



Smartmodem 1200 for all computers with an RS-232C interface; Smartmodem 1200B plug-in board for the IBM PC.

Smartmodem Specifications:

Low Speed Data Format: (Smartmodem 1200 and Smartmodem 300) Serial, binary, asynchronous; 7 or 8 data bits; 1 or 2 stop bits; odd, even or no parity (0-300 bps).

High Speed Data Format: (Smartmodem 1200) Serial, binary, asynchronous; 7 data bits; 1 or 2 stop bits; odd, even, or fixed parity or 8 data bits; 1 or 2 stop bits; no parity (1200 bps).

Dialing Capability: Touch-Tone® and rotary-dial pulse dialing.

Command Buffer: 40 characters.

Commands: (unnecessary with Smartcom II software)

A: Immediate answer. A/: Repeat last command. C: Transmitter Carrier. D: Dial command, including simple dialing, waiting for second dial tone, auto-dialing and other features. E: Local echo. F: Full/half duplex. H: Switch hook. M: Audio monitor. O: On-Line. P: Pulse dialing. Q: Quiet mode. R: Reverse originate/answer mode. S: 17 "Set" commands speed, escape code character, number of rings to answer on, etc. S/: Checks operational parameters above. T: Touch-Tone dialing. V: Verbal result codes.

Result Codes: (can be numerical/verbal): 0/OK: Command line ok. 1/Connect: Carrier detected. 2/Ring: Phone is ringing. 3/No Carrier: Carrier lost or never heard. 4/Error: Error in command line. 5/Connect 1200: Carrier detected at 1200 bps. (Smartmodem 1200 only.)

Audio Monitor: Two-inch speaker with volume control.

Rear Panel: On-off switch, power jack, RS-232C connector, modular phone jack connector, volume control.

Operation: Full or half duplex.

Data Rate: 0-300 bps and 1200 bps for Smartmodem

1200; 0-300 bps for Smartmodem 300.

Interface: RS-232C.

Intelligence: Z8™ microprocessor with 4K byte control program for Smartmodem 1200; Z8 microprocessor with 2K byte control program for Smartmodem 300.

Modem Capability: Bell System 103 or 212A compatible originate or answer mode for Smartmodem 1200; Bell System 103 compatible originate or answer mode for Smartmodem 300.

Receive Sensitivity: -50dBm for Smartmodem 1200; -45dBm for Smartmodem 300.

Transmit Level: -10dBm.

Registration: FCC registered for direct-connect to the nationwide phone system. Connects with modular jacks RJ11W, RJ11C, RJ12W, RJ12C, RJ13W, RJ13C.

Power Pack: U.L. listed 120VAC, 60Hz, 13.5VAC output.

Size: 1.5" x 5.5" x 9.6"

LAN Roundtable

(Continued from page 104)

McGrath: We're looking at three alternatives to providing data communications within buildings. LANs are one. The PABX is another, and the information center providing services from a central host computer via a star network is the third. We don't think any one approach will provide the solution throughout Warner-Lambert. There will be a combination of all three, depending on the requirements of particular departments.

Chou: I view the PABX as a kind of local-area network. One advantage of an LAN is the communications speed provided by the bus architecture. With the new, faster PABX switches, the gap between the two approaches becomes smaller.

Passas: AT&T's System 85 and Rolm's new CBX II, which both integrate voice and data communications, interest us because we'd like to have both on a single line. It would make wiring more economical. But because AT&T's communications architecture is unique, you have to use its terminals.

Bazinet: And I wonder whether the twisted-pair wires you'd be using with a PABX would provide enough bandwidth to handle applications involving computer-to-computer communications, as virtually all of them will.

Passas: Twisted-pair wires can handle voice and data simultaneously. But if you want to transfer computer files at a very high speed, they won't do the job.

Cotton: Many organizations are looking at digital PABXs as a way of handling their terminal-to-computer traffic. Most users would be very happy to communicate at 64 Kbits per second, the conventional pulse-code modulation for digital voice. Computer-to-computer file transfers may need more speed—in the range of Ethernet's 10 million bits per second. But the digital PABX will be a formidable competitor when the vendors solve some of the software and protocol problems. You need data-flow control, speed conversion, code conversion, and other ancillary ser-

vices. The general-purpose processors built into the digital PABXs could handle these tasks, but the programming effort to get them to do it will be great.

One other alternative to LANs that's feasible in some situations is piggybacking a data network on a cable-TV system. A television camera on the floor of the U.S. House of Representatives transmits proceedings to members of Congress and their staffs, for example. Several channels on the system also carry data.

Q: What issues should network designers consider in deciding between a broadband and baseband approach?

Passas: That decision depends on how large the network is, how many users will tap into it, and the traffic. If you're going to have very high volume, you'll probably want broadband.

Bazinet: But if you do go broadband, you'd better be sure where you're going to put your taps. It takes a considerable engineering effort to add them, much more than with baseband.

"LANs will be vehicles for integrating personal computers, office systems, and mainframes."

Bazinet, American Can

Another primary difference between the two technologies is that broadband is very mature, while baseband has a lot of growing to do. Broadband has been used by cable-TV companies for over 25 years. What you see now is pretty much what you'll have in 20 years. Baseband, on the other hand, will show a lot of improvements—higher speeds through data compression, and so on.

McGrath: We felt that the main advantage of using broadband at Warner-Lambert would be in teleconferencing, since it can carry full-motion video. But we probably

LAN Roundtable

(Continued from page 107)

wouldn't want to place teleconferencing rooms throughout our corporate headquarters. We'd want to set aside just one room for communicating with other locations. Ethernet's baseband network, on the other hand, offered several attractive features. Its

specifications are published, making it easier for vendors to suit their equipment to it. It's less expensive than most broadband systems. And, since it's digital, it would allow for a smooth transition to fiber optics, also a digital technology, as that approach

becomes more viable.

Cotton: There are pros and cons to both broadband and baseband. In some situations, for example, when a user wants to carry video and data over the same line, broadband might be the best choice. And if you already have a lot of devices from Wang, you'll want to look at its broadband network. There's an advantage to dealing with only one vendor's sales rep. There may also be benefits to working with broadband's well-understood, conventional cable-TV components. However, the choice between baseband and broadband depends on your particular requirements. It should be an unemotional engineering decision.

Chou: You may have to allow both network types to coexist in your company. One department's needs may dictate baseband; another's might call for broadband. How do you link the two networks to make them look like one? The technology for that will come.

Q: There are *many* issues to consider in analyzing and managing LANs. How should a company organize its effort?

Cotton: The LAN failures I've seen have resulted more from organizational than technical difficulties. The company puts in the network, then doesn't know what to do with it. The question is: Who should oversee the system? Should it be dp? Communications? Administrative services? I favor setting up information-resources management to bring all the information technologies under one roof. They need to be managed as an integrated whole to take advantage of the synergies.

Passas: At FAIA, we place responsibility for design and development of communications within information services. The facility's operation is a user function, delegated to office services. But the selection of methods, hardware, and software is an engineering task, similar to information-systems design.

McGrath: Both the telecommunications and office-systems functions at Warner-Lambert are within the



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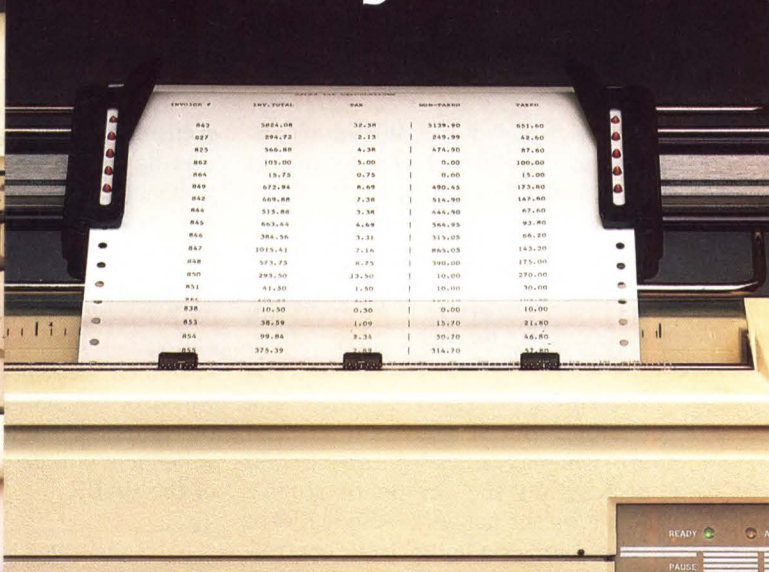
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LAN Roundtable

(Continued from page 108)

same MIS structure. We've experienced few conflicts, partly because of this arrangement.

Q: What LAN advancements would be helpful, and which do you expect to see developed soon?

Passas: A network-addressing scheme would be very helpful. If you want to make a telephone call, you can find the individual's number in a directory. But if you want to send data, you may not even be able to find out whether the person to receive them is on the network. And if I want to send data or a letter to our controller in Chile, I have to telephone him to get his terminal's address.

Baron: Witco made a commitment to IBM's Systems Network Architecture a few years ago. Then we acquired another company that had made the same commitment. Communicating between the two systems is still difficult, primarily because of the addressing obstacle. The parent has one set of addresses, the subsidiary another. In at least one case, two terminals had the same address.

McGrath: Ethernet handles this issue fairly effectively with a clearinghouse for addresses. The clearinghouse updates itself as a background activity when there are changes and communicates with the clearinghouses for other attached Ethernets. I'd like to see LAN developments move toward integration of

even more technologies. We've been waiting for image and voice features to be added to our LAN. I think we may have a long wait.

Cotton: Within the next few years, we'll see the interfaces for popular networks available on \$20 silicon chips that manufacturers can build into their personal computers. This will drop connection costs by one or two orders of magnitude. Another development will be in the functionality of the PABX.

"You may be able to justify an LAN simply as a replacement for a communications system."

Cotton, Booz, Allen & Hamilton

Passas: I agree. The PABX will replace the LAN's communications-control unit and the modems we've needed to attach to a host computer.

McGrath: We expect to plug existing equipment—electronic typewriters, facsimile machines—into our LAN, and we'll be adding a lot of IBM Personal Computers. The direction IBM takes with its LAN will probably have a greater impact on our company's plans than any other development.

Bazinnet: The system IBM demonstrated in Europe is based on a cable with two data-grade twisted pairs, two voice-grade twisted pairs, and two optical fibers all jacketed together. It's a multimedia cable. The product employs star-loop topology, which means there will have to be a

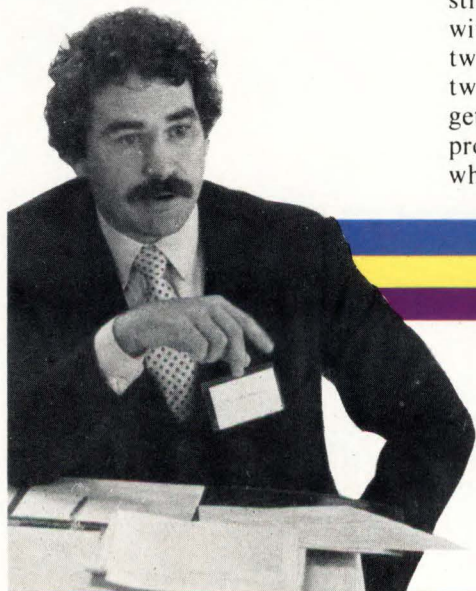
central wiring closet on each floor similar to the telephone-wiring closet most buildings have.

Cotton: It's difficult to know what IBM's LAN will do, what it will cost, and when it will be available. It does seem, though, that with the need for closets to hold all the wiring, it will be difficult for organizations to try out with pilot projects. It won't be like stringing 50 meters of wire and playing with a few terminals. You'll have to go in up to your neck just to get your feet wet.

Baron: With the technology developing so rapidly, it's difficult to know which choices to make. You might end up installing something that's obsolete the day you turn it on. Not long ago, for example, we bought some terminals that had to be located within 500 meters of the computer. So we rearranged offices, moving users closer to the mainframe. Six months later, a new version of the terminal came out that worked at three times the distance. Had we waited, we wouldn't have had to move anyone.

Chou: My company has already decided to install 10,000 IBM Personal Computers over the next three years. We won't be using any IBM 3270 terminals anymore. LANs will provide the communication speed needed to tie all those PCs together. I hope that there aren't still 300 LAN vendors in three years, so we won't be as confused as we are today. □

Computer Decisions wishes to thank Omicron, The Center For Systems Humanics, in Morris Plains, NJ, for its help in organizing this LAN roundtable.



"I'd like to see LAN developments move toward integration of many more technologies." *McGrath, Warner-Lambert*

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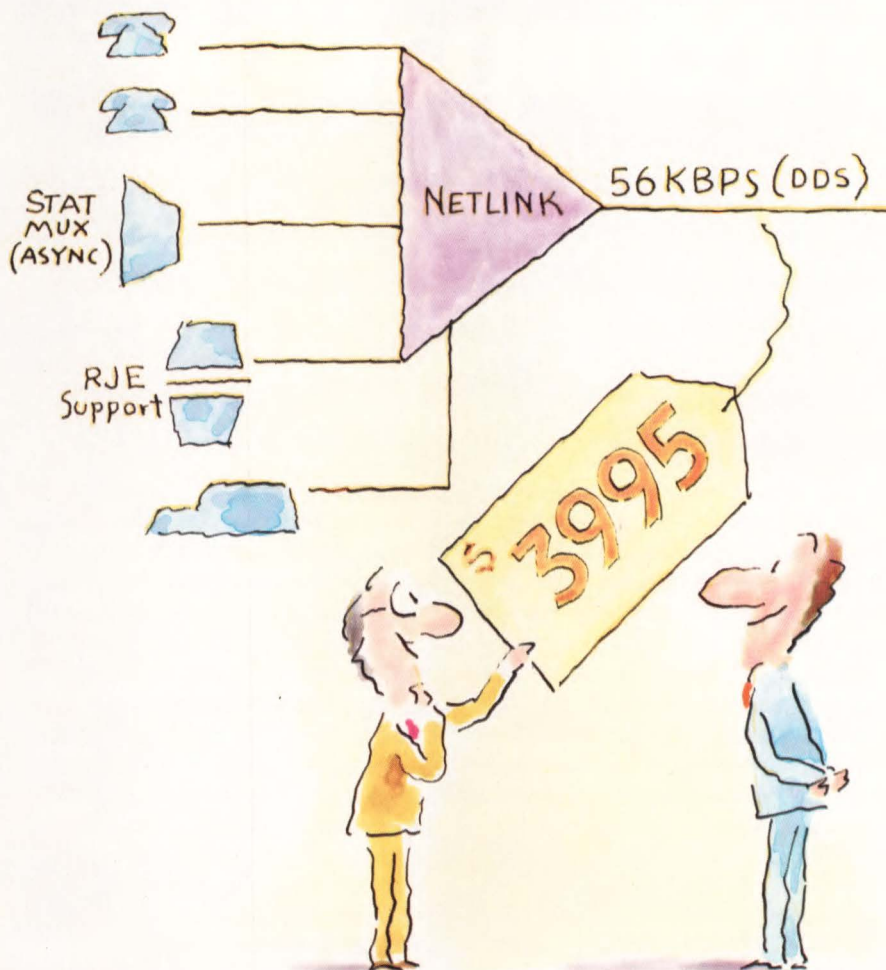
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Office automation

Connecting The Incompatible

Total compatibility. Managers dream of it. Vendors strive for it. But few offices have it—so far. Here's how to avoid chaos until you find the perfect solution to office automation.

by Jennifer Beaver, Southwestern Editor

Managers of incompatible office systems are like interpreters in the Tower of Babel—they're expected to accomplish the impossible. For example, when senior management weighs the benefits of acquiring another corporation, the compatibility of both companies' office equipment is rarely considered. Yet after the purchase has been made, the OA manager is called upon to make the two alien automated worlds communicate.

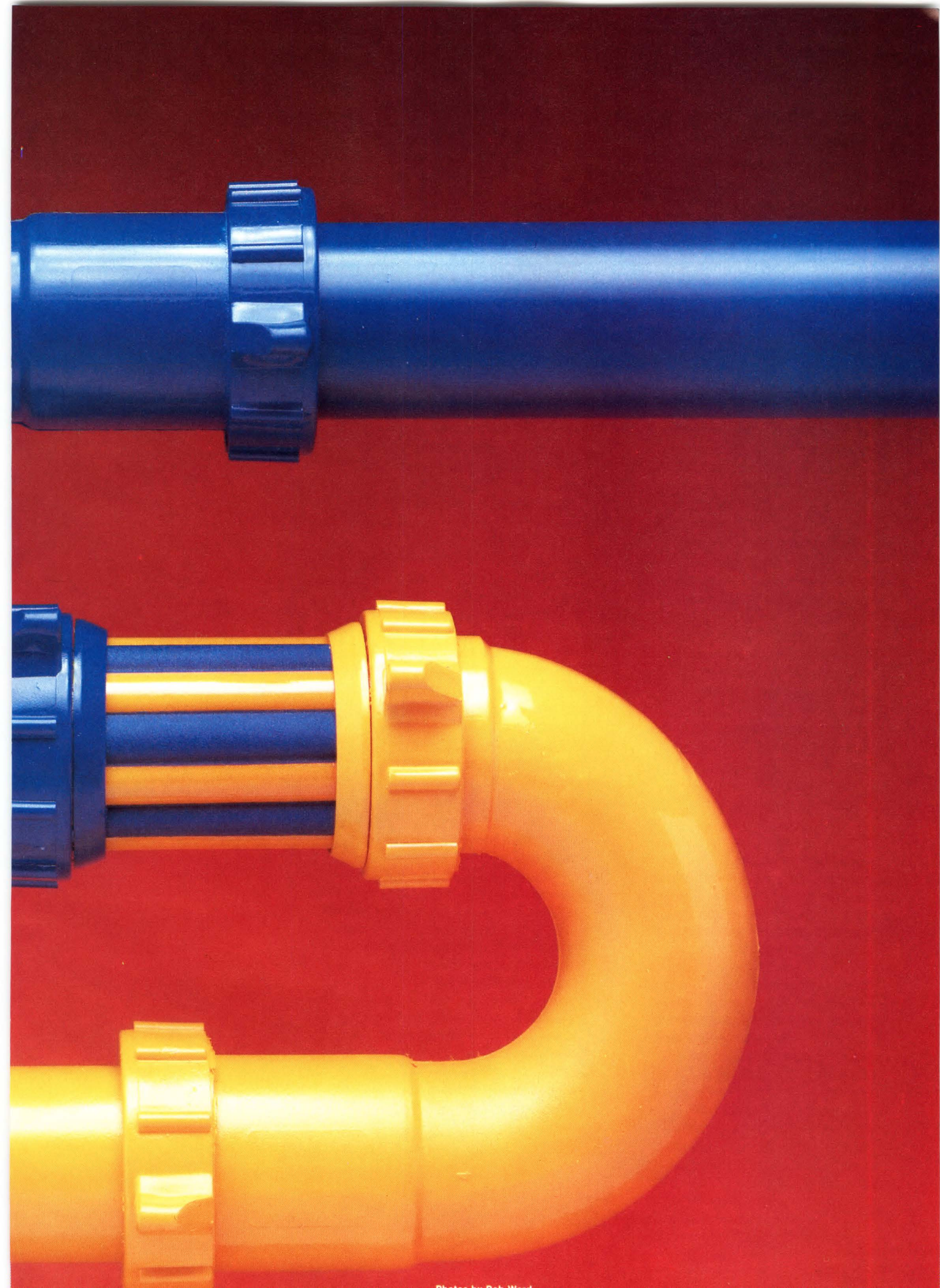
The OA manager is expected to give the organization the best of both worlds—efficiency and compatibility. Yet when purchasing new equipment, the manager often must give compatibility priority over other benefits. High performance or

advanced features in an incompatible machine are usually not worth the cost of discarding old equipment.

Vendors have long searched for office automation's total solution—the package, board, or box that will tie together all your different brands of equipment. But so far, no such panacea exists. Dale Way, marketing vp for Excelan, says it will be three years before vendors make significant progress in compatibility. Excelan develops internal local-area networks (LANs) that help computer makers tie together their own and other vendors' equipment.

Systems manufacturers are also taking steps to promote compatibility. They're





Office Automation

translating their products' codes, operating systems, and architectures to improve their products' ability to communicate with each other and with those from other vendors—particularly IBM and Wang. However, these developments are so new that few users have been able to judge their merits.

Progress in equipment compatibility seems slow to managers who are in a rush to integrate their offices' equipment. Some companies have decided not to wait for the vendors to come through, and have developed custom connections. But not all office-automation staffs can follow suit. It takes a lot of time, expertise, and clout to get the data-processing, data-communications, office-automation, and administrative staffs to cooperate and do the job. Like it or not, most businesses will have to wait for vendors to solve their compatibility problems.

In the meantime, organizations can take steps to ensure easy systems integration, when the time comes. One way is to limit equipment purchases to three vendors per office. Some consultants say the most positive step you can take to plan for your integrated office is to clamp down on the personal computers sneaking into your organization. These devices have limited impact on an organization when used as stand-alones. But trying to network a dozen brands of micros is the stuff of many a manager's nightmares.

As IBM representatives are fond of saying, the process of connecting equipment is evolutionary, not revolutionary. Any vendor that claims to have the total solution to your

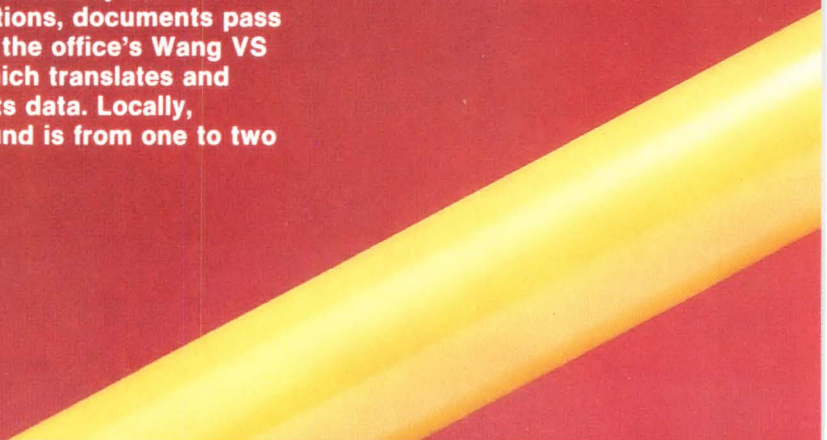
compatibility problems should be regarded suspiciously—at least for now. No one product can get all your mainframes, minis, micros, and peripherals to talk to each other. But don't despair; there are ways to keep them from remaining total strangers.

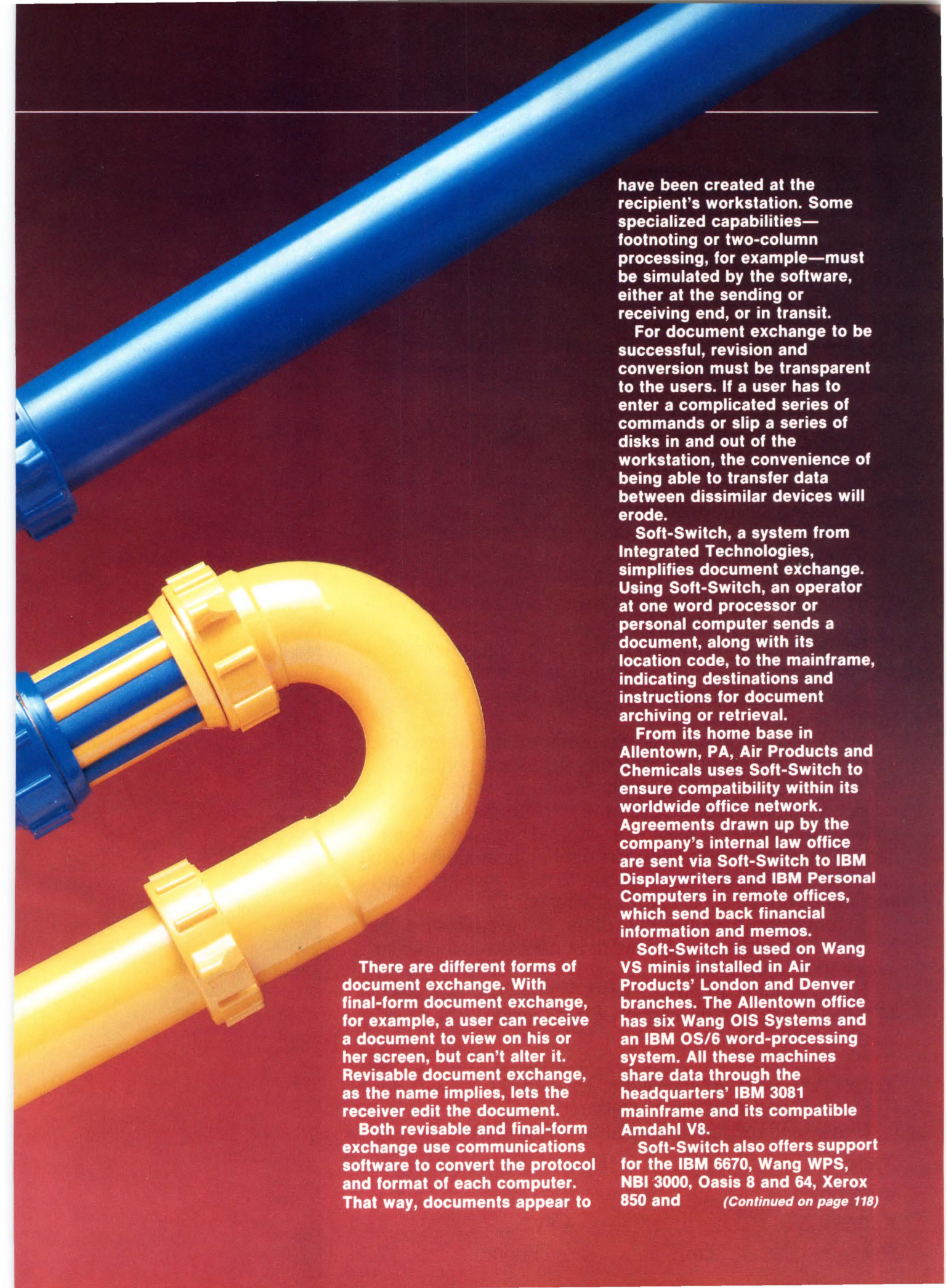
Dale Ensminger, manager of computer hardware in Rockwell International's Dallas office, faced a problem shared by many other managers of Fortune 500 companies. He needed to expand the office's automation system and get the new purchases to exchange documents with existing Wang equipment.

Ensminger envisioned a shared system that would maximize the efficiency of development tools and peripherals, link the office's IBM 3033 mainframe with the Control Data Cyber in Rockwell's Seal Beach, CA, office, and exchange documents with his office's Wang OIS 30 and OIS 40 word-processing systems. To ensure both performance and compatibility, he evaluated a lot of products. He finally selected a Data General MV8000 minicomputer, 32 DG micros, and DG's CEO software.

The system lets Rockwell's users create documents on their micros and send them to Wang word processors for fine tuning. A bi-directional transfer lets them send as many as 140 pages of revisable material at a clip. On their way between workstations, documents pass through the office's Wang VS mini, which translates and reformats data. Locally, turnaround is from one to two

hours; documents from the west coast may take overnight to reach their destination. A few stand-alone Wang word processors handle confidential documents. Ensminger reports only minor compatibility problems. For example, the Data General micros paginate automatically, but the Wang word processors require manual numbering.





have been created at the recipient's workstation. Some specialized capabilities—footnoting or two-column processing, for example—must be simulated by the software, either at the sending or receiving end, or in transit.

For document exchange to be successful, revision and conversion must be transparent to the users. If a user has to enter a complicated series of commands or slip a series of disks in and out of the workstation, the convenience of being able to transfer data between dissimilar devices will erode.

Soft-Switch, a system from Integrated Technologies, simplifies document exchange. Using Soft-Switch, an operator at one word processor or personal computer sends a document, along with its location code, to the mainframe, indicating destinations and instructions for document archiving or retrieval.

From its home base in Allentown, PA, Air Products and Chemicals uses Soft-Switch to ensure compatibility within its worldwide office network. Agreements drawn up by the company's internal law office are sent via Soft-Switch to IBM Displaywriters and IBM Personal Computers in remote offices, which send back financial information and memos.

Soft-Switch is used on Wang VS minis installed in Air Products' London and Denver branches. The Allentown office has six Wang OIS Systems and an IBM OS/6 word-processing system. All these machines share data through the headquarters' IBM 3081 mainframe and its compatible Amdahl V8.

Soft-Switch also offers support for the IBM 6670, Wang WPS, NBI 3000, Oasis 8 and 64, Xerox 850 and

There are different forms of document exchange. With final-form document exchange, for example, a user can receive a document to view on his or her screen, but can't alter it. Revisable document exchange, as the name implies, lets the receiver edit the document.

Both revisable and final-form exchange use communications software to convert the protocol and format of each computer. That way, documents appear to

(Continued on page 118)

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For example, the 8010's extensive software is fully integrated, to allow you to work with text and graphics simultaneously. You can draw a flowchart right in the middle of a full page of text without having to resort to a separate program and limited buffer "scratchpad" or "clipboard."

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Input/output systems

The three basic techniques used by computers to interface to the outside world are 1) interrupts, 2) programmed input and output (PIO), and 3) direct memory access (DMA). To describe these techniques, it is helpful to break down the internal organization of a computer into four functional units or blocks, i.e., the memory, IO, arithmetic logic unit (ALU), and control unit. Figure 4 shows this functional breakdown for first, the von Neumann as well as the bus structured architectures.

As shown in both, interrupts are signals from external devices through the IO unit to the control unit. These signals tell the computer of a specific event and usually affect the program currently being run in the computer. No data is transferred by the interrupt signal, only the presence of the interrupt is studied.

PIO is done by having the program explicitly transfer the data between the IO unit and either the registers in the ALU or the memory unit. On the other hand, DMA occurs when data is transferred between the IO unit and the memory unit without program intervention, except for initialization.

Interrupts

An interrupt is a signal from outside the computer that something has taken place. The general process of sensing an interrupt is that, first the interrupt arrives at the IO unit, which in turn, informs the control unit. The program is stopped at the conclusion of the program.

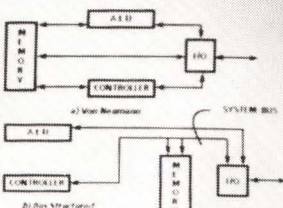
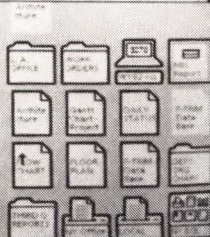
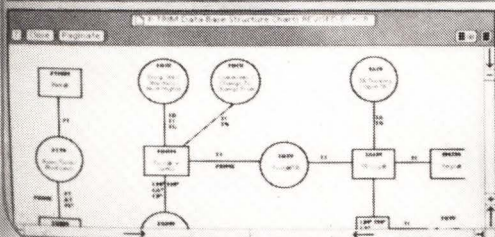


Figure 4: Computer architecture

These diagrams show the internal organization of the computer into four functional units or blocks, i.e., the memory, IO, arithmetic logic unit (ALU), and control unit. The diagram shows this functional breakdown for first, the von Neumann as well as the bus structured architectures.



Office Automation

(Continued from page 115)

860 word processors, and the Multi-mate word-processing system executed on an IBM PC. All translation is done using IBM's Document Content Architecture (DCA).

Protocol converters

Some companies invest in products that help forge communication links between previously incompatible machines. The black box known as the protocol converter is one such device.

Protocol converters, which have been in use for almost 10 years, allow

otherwise incompatible computers to talk to each other and pass files back and forth. Protocol converters are useful, but they're not total solutions to compatibility problems. According to Mark Hayward, an office-systems consultant at Walter E. Ulrich Associates in Houston, protocol converters provide about 95 percent compatibility. If you use a protocol converter to transfer data, you may lose formatting instructions or underlining capabilities. "The result may be a document you would use internally,

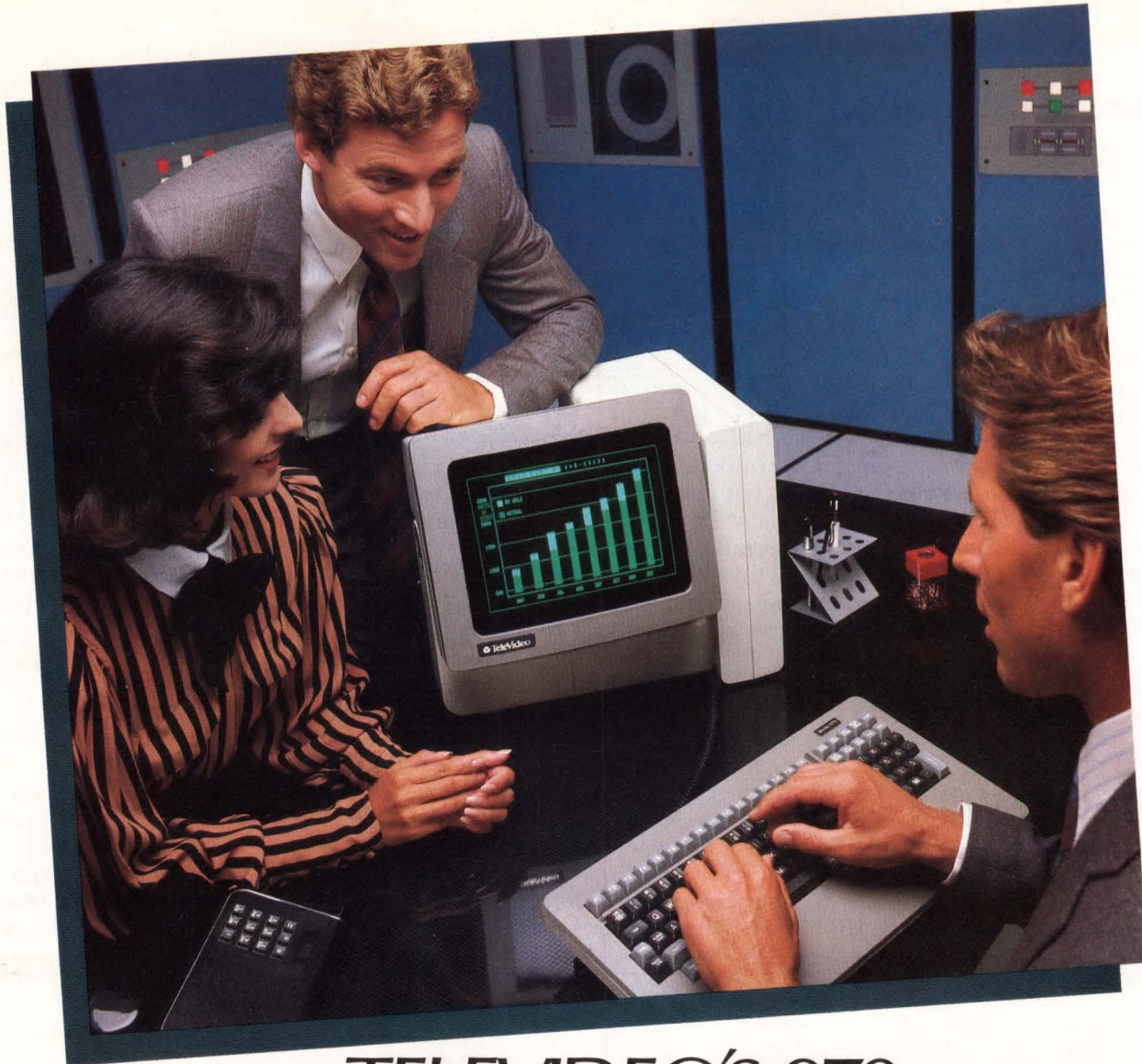
but wouldn't want to send out to another company," explains Hayward.

Protocol converters are used by Ford Motor Co. to transfer messages between many incompatible workstations nationwide. The converters are installed at the Operations Center of Worldwide Integrated Communications, an electronic-mail service offered by Mohawk Data Sciences.

Mayford Roark, executive director of systems for Ford, reports some 500 terminals on the system. He ex-

Selected vendors of protocol converters

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Alphamatrix (215) 355-3297 Circle 747	Bridge Communications (408) 446-2981 Circle 758	Diversified Data Resources (415) 499-8870 Circle 769	Innovative Electronics (305) 624-1644 Circle 779	Memotec (514) 738-4781 Circle 789
American Computer Hardware (714) 549-2688 Circle 748	California Computer Syst. (408) 734-5811 Circle 759	Dynatech Packet Tech. (703) 642-9391 Circle 770	Intecom (214) 727-9141 Circle 780	Micom Syst. (213) 998-8844 Circle 790
Analog Precision (602) 622-1344 Circle 749	Cardamation (215) 647-8260 Circle 760	Eastern Peripherals (215) 348-7493 Circle 771	Integrated Design Engineering (314) 343-0005 Circle 781	Microcom (617) 762-9310 Circle 791
Applied Data Communications (714) 731-9000 Circle 750	Com/Tech Syst. (212) 594-5377 Circle 761	Electronic Distribution Processing (213) 346-5834 Circle 772	Inteq (703) 273-7460 Circle 782	Mira Electronics (416) 265-3020 Circle 792
Applied Syst. (301) 951-0122 Circle 751	Compu Comm (217) 352-2477 Circle 762	Envox Syst. (214) 258-1050 Circle 773	Interface of Illinois (312) 883-1700 Circle 783	Mitron Syst. (301) 992-7700 Circle 793
Ark Electronic Products (305) 724-5260 Circle 752	Computerwise (816) 765-3330 Circle 763	Ese Ltd. (416) 749-2271 Circle 774	Int'l. Anasazi (602) 275-0382 Circle 784	Modemsplus (404) 378-5276 Circle 794
Avanti Communications (401) 849-4660 Circle 753	Crosspoint Syst. (503) 485-4254 Circle 764	Frederick Electronics (301) 662-5901 Circle 775	Itek Composition Syst. (603) 889-1400 Circle 835	MPL Syst. (201) 256-3773 Circle 795
Avant-Garde Computers (609) 424-9620 Circle 754	Data Plus (703) 550-7914 Circle 765	Gandalf Data (312) 541-6060 Circle 776	Kaufman Research Mfg. (415) 962-8811 Circle 785	Nesco (408) 737-2080 Circle 796
Avatar Tech. (617) 435-6872 Circle 755	Datagram (401) 885-4840 Circle 766	lcot (415) 964-4635 Circle 777	KMW Syst. (512) 288-1453 Circle 786	Netron (416) 636-8333 Circle 797
Backus Data Syst. (408) 279-8711 Circle 756	Dataprobe (201) 947-9500 Circle 767		Local Data (213) 320-7126 Circle 787	Nu Data (201) 842-5757 Circle 798
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For operator comfort, the 970 keyboard offers a naturally contoured palm rest and sculpted keys, and non-glare 14-inch tiltable screen. You can utilize either the 80 column format, with 3 pages of memory, or 132 columns with 2 pages.

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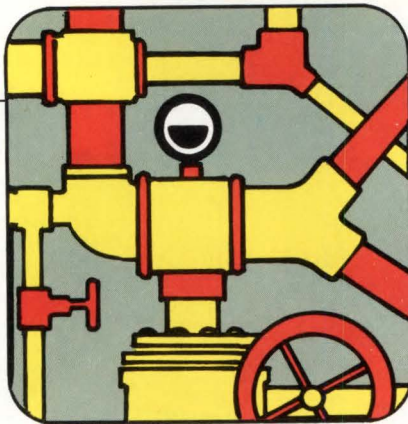
Service is available nationwide from General Electric Electronic Instrumentation and Computer Service Centers. VT-100 is a registered trademark of Digital Equipment Corporation.

Office Automation

(Continued from page 118)

pects this total to grow into thousands by next year because, he says, the system is much more efficient than phone communications. A single Racal Telesystems converter is used for each brand of word processor or terminal tied to Ford's system. Roark himself enters messages into the system on a DEC 350 personal computer in his office and on a Radio Shack TRS-80 Model 3 at home.

In Chicago, at Union Carbide's film-processing division, Avatar model TA 1000 protocol converters (\$995) let DEC terminals access IBM host computers in Tarrytown, NY, and South Charleston, VA. Before the converters were installed, the DEC terminals were used only to access the division's DEC PDP-11/34 mini, and IBM terminals talked to the host mainframe. Now, a single keystroke switches users from IBM mode to DEC—without interrupting a project. "The system also lets us weed out the not-so-friendly IBM



terminals and rely more on the easy-to-use DEC equipment," explains Frank Pedesco, staff assistant, operations-technology division.

Connecticut Mutual Life, another organization that uses protocol converters, is strictly an IBM shop. But to get its 1,200 IBM PCs to communicate with its Hartford-based IBM 3081, the insurance carrier turned to a new vendor—Micom.

John Breen, associate director of Connecticut Mutual's dp department, designed a network that incorporates one protocol converter, several IBM PCs, and a corresponding number of printers in each office. The converter allows each PC to em-

ulate a 3278 terminal. "The personal computers interact with the mainframe as they would a jumbo floppy disk," relates Breen.

Why doesn't Breen use a software package for emulation? He finds it cheaper to use a protocol converter when several personal computers are clustered, as they are in most of Connecticut Mutual's offices. Software emulation would require purchase of not only a conversion package, but also a coaxial or an RS232 interface. Both items would cost about \$900 per IBM PC. A four-channel protocol converter from Micom, on the other hand, costs \$2,950—or \$740 per IBM PC. The price drops to \$400 per connection if a 12-channel protocol converter is used.

Another advantage: Protocol converters save costs because they let an office use one phone line, instead of two, to connect its personal computers and printers to a mainframe. Data

(Continued on page 124)

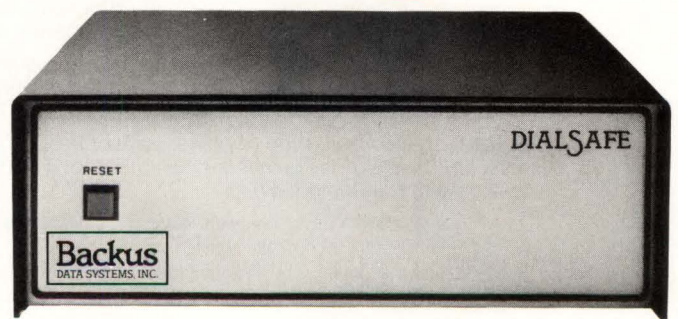
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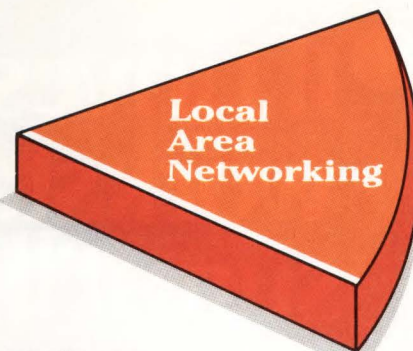
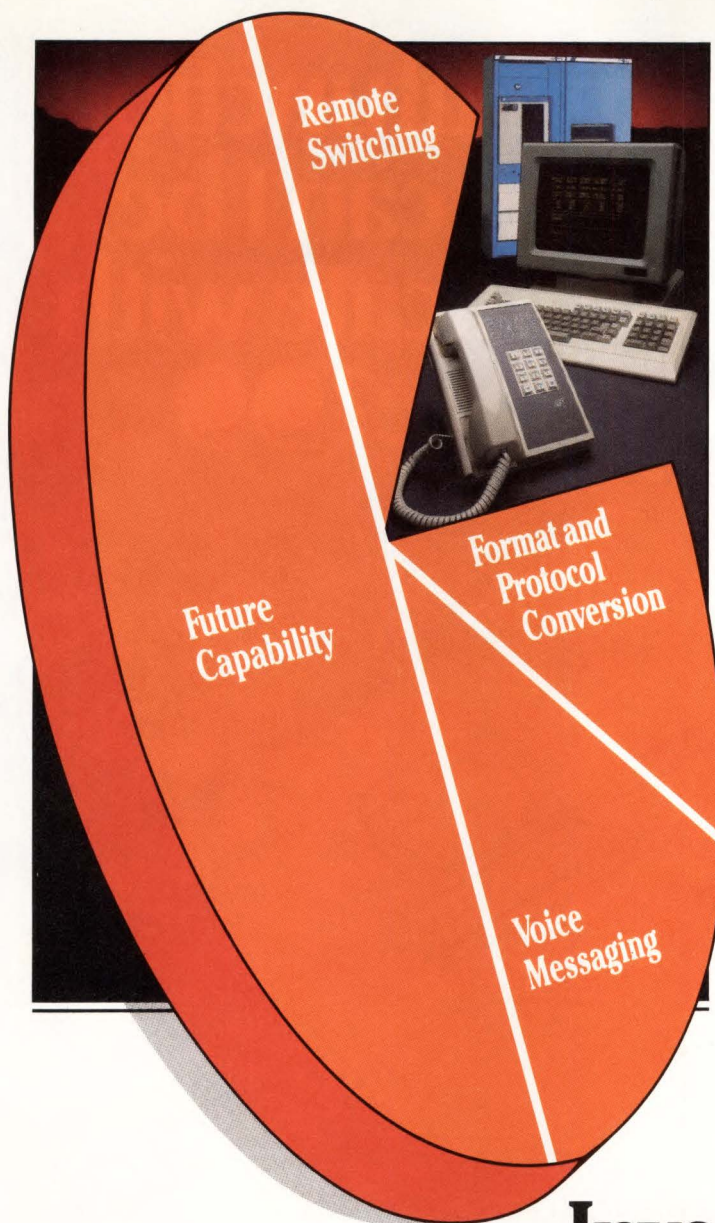
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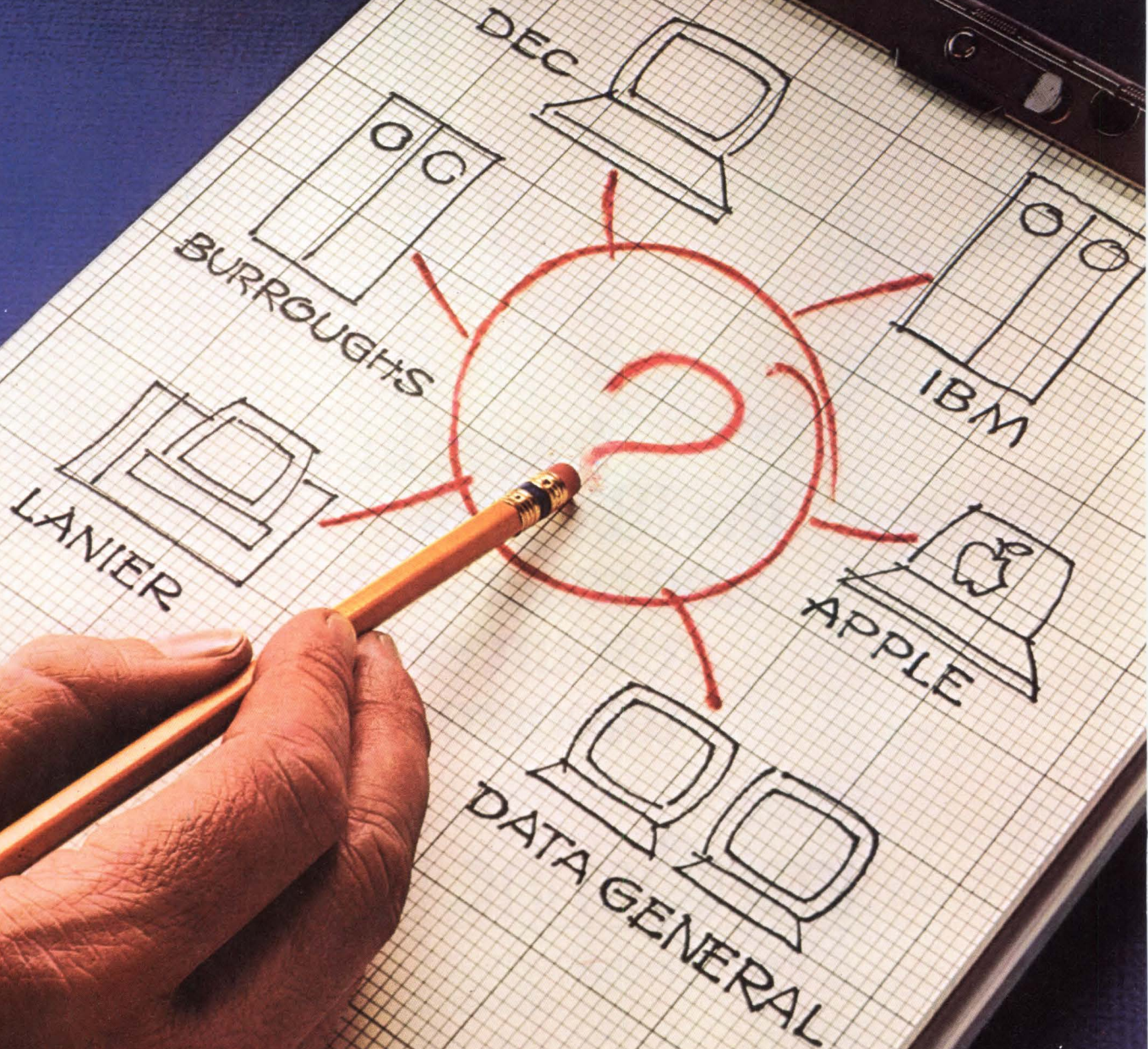
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Office Automation

(Continued from page 120)

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Is your Mainframe suffering midlife crisis?



travel from the mainframe directly to the personal computer, which filters out instructions to the printer. Breen says this procedure can be slower than using two dedicated phone lines, but it's far less expensive.

Racal Telesystems has three models of protocol converters that can translate the signals of up to 17 word processors and peripherals, which make up about 85 percent of all office-automation equipment installed. These converters don't, however, translate incompatible printing-format codes, and users still must waste time reformatting documents for output.

Protocol Computers also makes boxes and software. Its products let a wide variety of computer models communicate with IBM devices.

LANs: An unkept promise?

Perhaps of all developments in office automation, those in local-area networks (LANs) have been most

hindered by weak communications links. IRD estimates there are only between 5,000 and 12,000 LANs installed in offices around the country.

What's the matter with LANs? Much of the communications software created for them fails to provide file exchange and protocol conversion. And because many LANs are proprietary, they can't always communicate with the networks of other departments.

Many consultants advise their clients not to adopt an LAN until the technology has more to offer. "Businesses aren't sure what benefits an LAN can offer. They're told their messages will be transported quicker—but how much faster can it be to use an LAN than to pick up pink slips at a secretary's desk?" asks Charles Jortberg, a consultant in Peabody, MA.

Even organizations that decide an LAN is warranted have trouble finding one that meets their needs. Ed

Nesserly, assistant regional administrator of the federal government's general-services administration in San Francisco, circulated his LAN requirements to 100 vendors before he found the right product.

Nesserly wanted to provide users with enhanced personal-productivity tools that would do what a pencil, paper, and calculator used to do. He also wanted to save money by letting users share those tools. The shared system he envisioned required fast, efficient communications, and used off-the-shelf software.

Only three vendors said they could demonstrate such a product—and when it came time to back up their claims, one vendor backed down. "If you believe the ads, it looks like a lot of networks are out there," says Nesserly. "But when you ask a vendor to demonstrate one, its representative might tell you the product won't be ready for a month or more."

Nesserly finally chose Plan 4000

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Office Automation

(Continued from page 125)

from Nestar. The vendor provided 54 IBM PCs and the ability to hook them together. The Nestar 4000 allows users to share both software and peripherals, and has built-in electronic-mail features. Nesserly circumvented a lot of expense and mess

by installing the new wiring for his LAN in the floor below. "It may have disturbed the people in the office beneath us, but they don't work for me," he commented.

Nestar also offers Plan 2000 and Plan 3000 for smaller clusters of mi-

cro. The vendor's products support Apple computers as well as IBM PCs and XTs.

Vendors vow to coexist

Until very recently, anyone who mentioned linking various IBM office systems was either complaining or joking. Wang ran ads in trade journals and newspapers that constantly pointed out the difficulty in upgrading and connecting IBM systems.

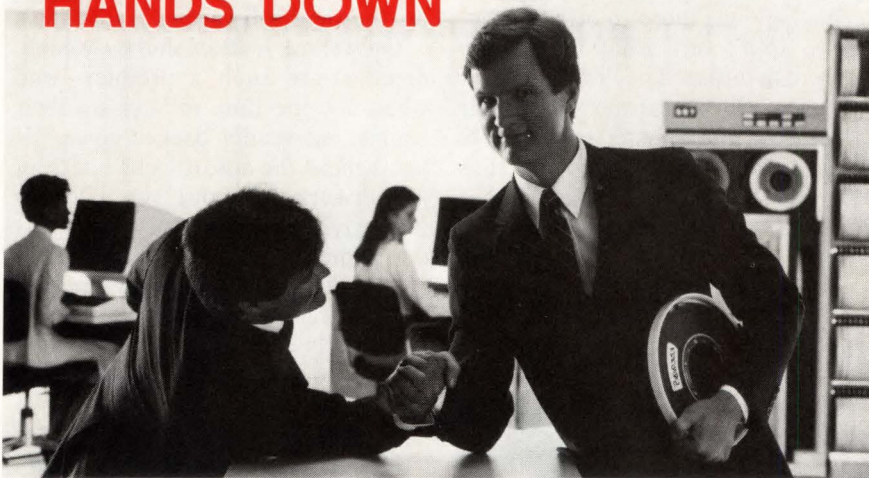
By October, however, all IBM office systems will be able to exchange documents—or so say IBM spokespeople. Consultant Hayward believes differently, however. He says incompatibility will continue to be a problem for users of IBM systems. "It's true the 5520 office system supports IBM PCs, but its keyboard is different. You can use an IBM PC to file data and retrieve them from the mainframe, but not to alter text."

Given the various compatibility problems of IBM operating systems, source codes, and software, you might want to donate your IBM systems to an office that doesn't intend to network, and invest your money in the IBM PC. IRD predicts IBM will probably forgo improvements in its shared-resource word-processor line to concentrate on providing enhanced word-processing capabilities on its PC.

Recent improvements in the IBM PC are increasing user satisfaction. The 3270 model makes mainframe communications much simpler. And by announcing that its PC will now support Bell Labs' Unix operating system, IBM gave the nod to multi-user arrangements. You can run Unix on a network of either IBM PC XTs or PCs equipped with fixed disks for a one-time license fee of \$900 per machine.

Last year IBM threw down the gauntlet containing its Document Content Architecture, making available to other vendors the codes and formats of its machines. A few of the wiser vendors, like Wang, took advantage of IBM's willingness to open up communications between its and other vendors' products. Wang's

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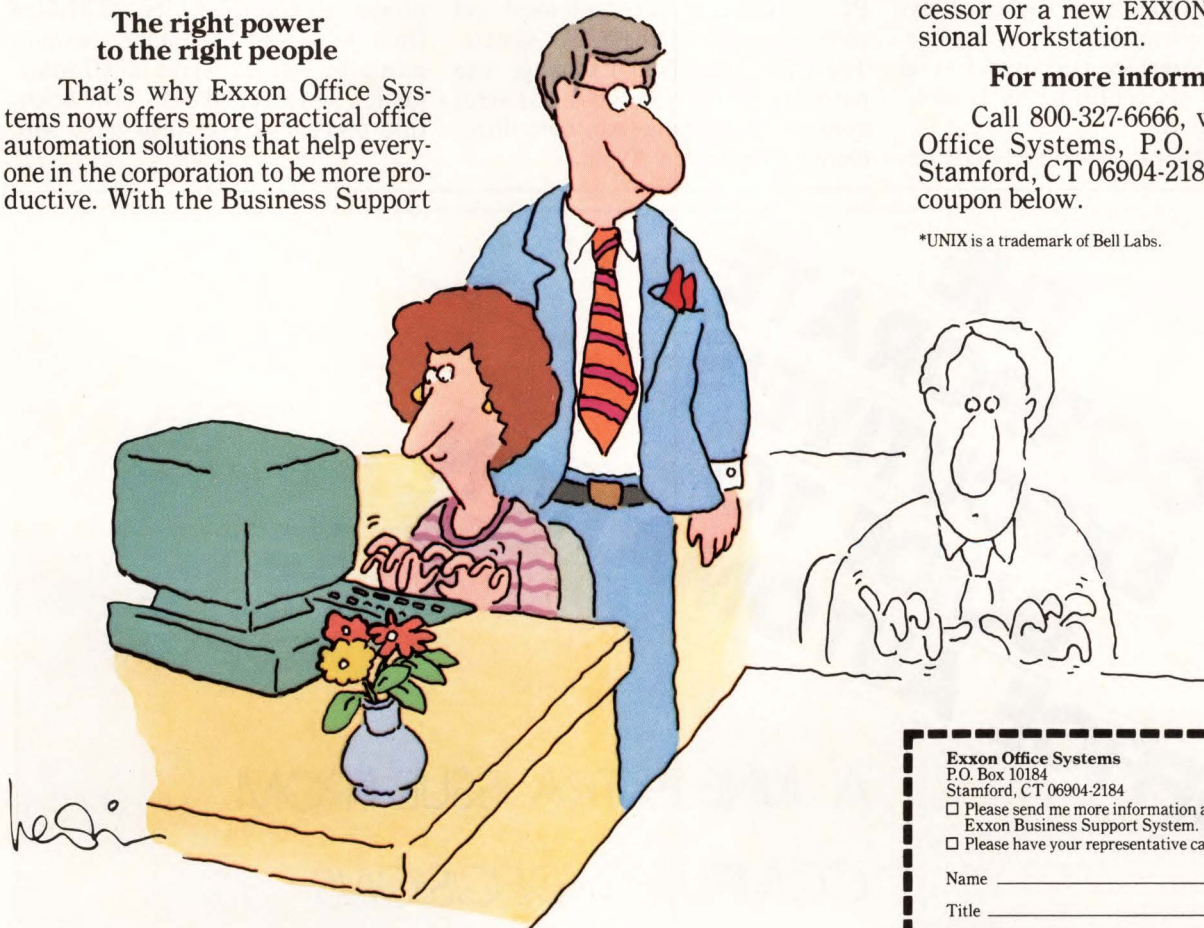
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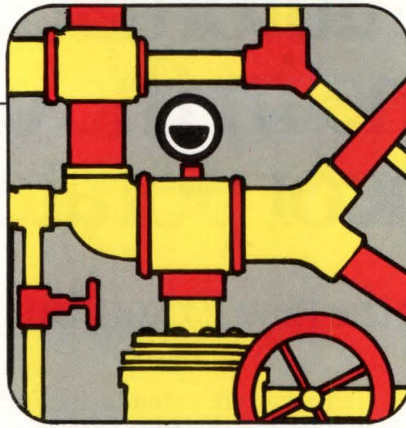
(Continued from page 126)

Big-Blue compatibility strategies include connecting Wang's VS mini and IBM or plug-compatible mainframes over a 3270 network. The host software costs between \$45,500 and \$58,000.

Wang is also providing an interface between Wang Office, which is Wang's network-based office-automation package, and IBM's Distributed Office Support System. And it has opened up its document-exchange architecture to let other vendors create communications between their products and Wang's.

Unlike IBM, Wang products are compatible with each other. Wang PC documents can be transferred directly to OIS, Wangwriter, 2200, Alliance 250, and VS systems. "There are few differences in keyboard layouts throughout Wang's product line. The user interface is consistent and not nearly as confusing as IBM's," says Hayward.

Data General, a relatively late en-



try into office automation, has made compatibility one of its advertising buzzwords. It intends to make inroads where others have failed.

Several developments make DG's CEO software extremely attractive to users running both Wang and IBM equipment. The package's IBM PC Dasher emulator lets IBM PCs access a CEO office network; it makes the IBM PC function as a CEO workstation. Loaded into the IBM PC, the diskette gives both local and remote access to the CEO system. The CEO Document Exchange also permits Wang and Data General systems to exchange editable documents. License fee: \$150.

Digital Equipment Corp. has also been listening to users' requests for compatibility. It announced software that links its VAX and VAX-resident All-in-One office system with IBM and Wang machines. The External Document Exchange (\$3,500) allows two-way communications between DEC VAX and Wang OIS systems. Another package lets IBM 3270 terminals connect directly to the VAX and run its applications. DEC has also improved communications within its product line with software that provides document transfers between DECmate word processors and VAX systems.

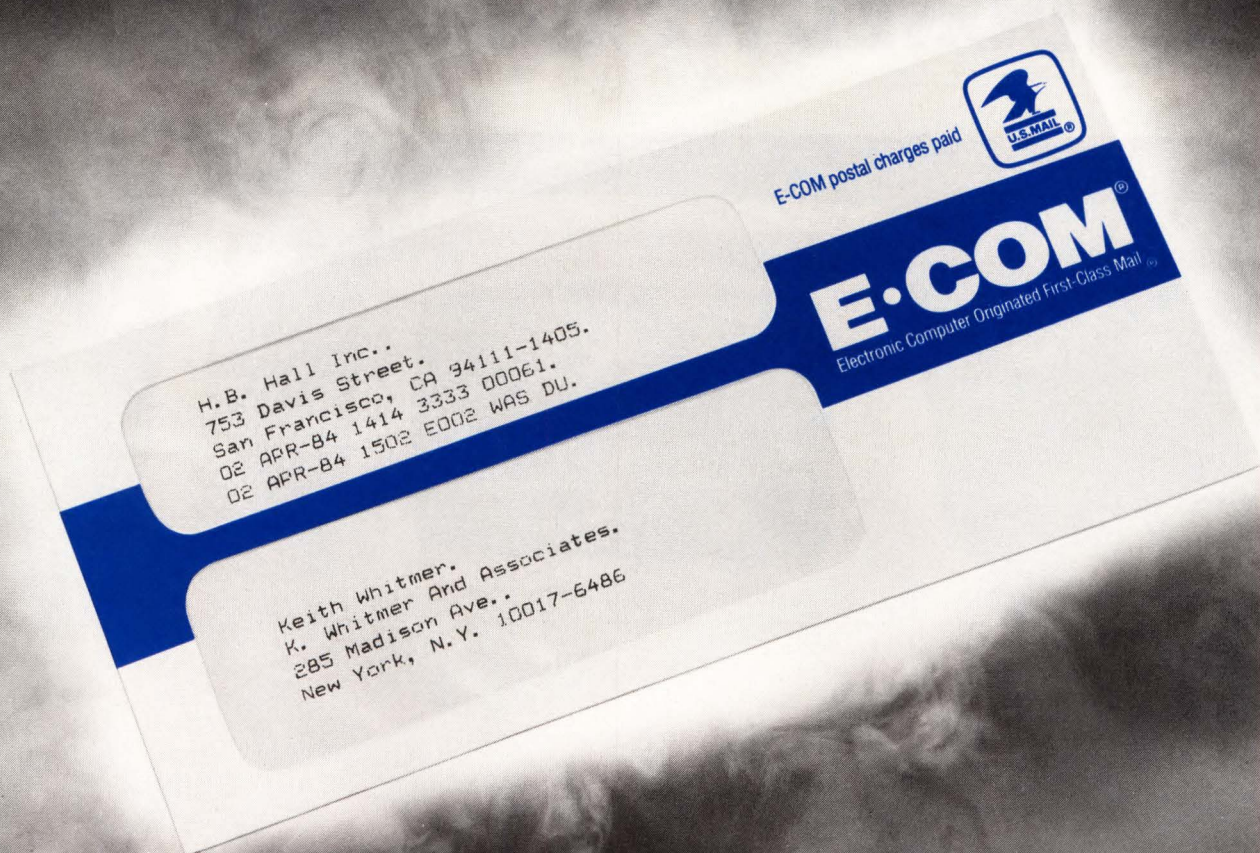
Xerox and two network vendors will be jointly providing communications software to improve Xerox products' compatibility. Software from Advanced Computer Communications will let Xerox 8010 information systems and SDS 1100 scientific processors exchange data with

(Continued on page 132)

THE CORPORATE EXECUTIVE'S GUIDE TO OFFICE AUTOMATION

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Office Automation

(Continued from page 128)

DEC's VAX and PDP-11 systems. In addition, Xerox, Visicorp, and 3Com are working on a joint project that will let IBM PCs running VisiOn software directly access services on Xerox's Ethernet network.

Harris Corp., a newcomer to office

automation, will ship its first systems early this year. These systems will be compatible with IBM and Wang products. Harris' 9000 series supports document exchanges of both vendors.

Even a vendor of fault-tolerant sys-

tems has recognized the need for compatibility. Stratus, a supplier of computers to the transaction-based business community, is offering IBM compatibility with its Stratus Office Solution (SOS). SOS connects IBM PCs, 3270s, and most conventional terminals to the fault-tolerant Stratus 32 Continuous Processing System. It also provides controlled access to files on IBM mainframes.

Managers of multi-vendor offices might want to look into Altertext systems, which are stand-alone personal computers that read and write both 8-inch and 5¼-inch floppy diskettes from a wide variety of word- and data-processing equipment. System I reads floppies and transmits files online to a front-end system, computer, or word processor. It also retrieves information via telephone lines and writes it onto a floppy disk. The price starts at \$12,000. System II, priced at \$20,000, provides disk-to-disk capabilities—it reads a disk created on one system and writes a new disk that is compatible with another system. Some of the disks Altertext can translate are from IBM, Wang, DEC, Xerox, Lanier, and CPT.

The missing link

The major setback to office-automation compatibility is a lack not of software or hardware, but of cohesive management. According to consultant Charles Jortberg, office automation is a prize piece of turf, over which data-processing, data-communications, and office-automation staffs constantly battle for control.

To share data and equipment, the three factions within information processing must work together. Hayward suggests appointing a chief information officer to coordinate concerns and technology among the different groups.

Those who insist on pulling office automation in different directions will probably pull it completely apart. Vendors will undoubtedly develop equipment compatibility, but it's up to corporations to start working on management compatibility. □



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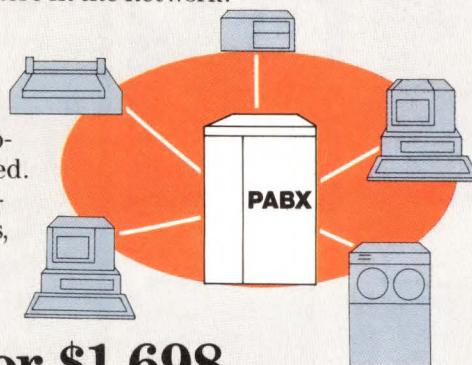
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Special Cabling	None Required	—
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Total Cost		\$1698

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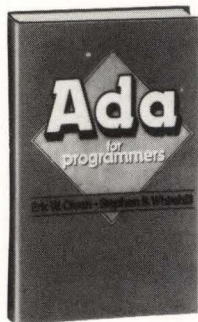
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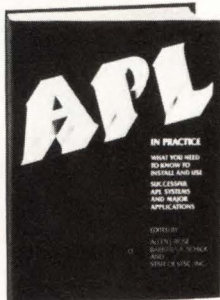
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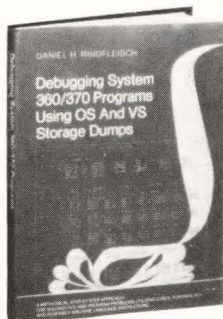
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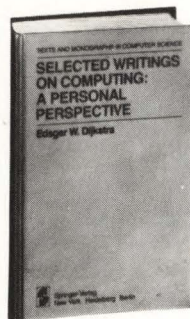
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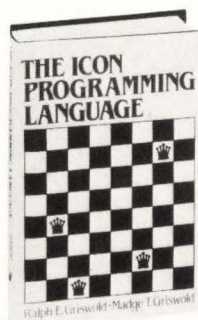
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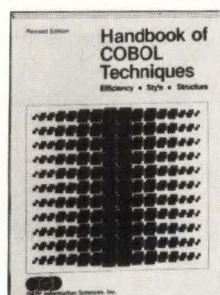
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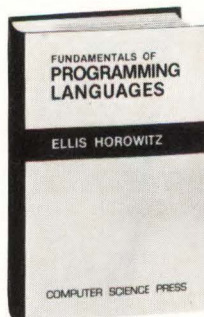
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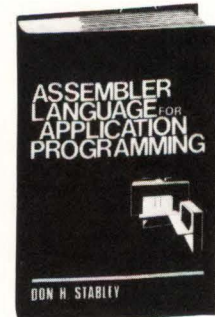
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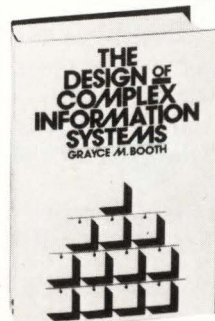


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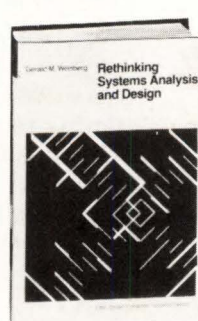
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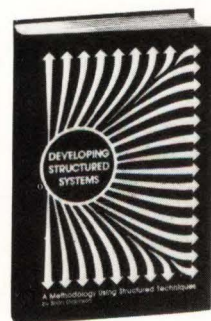
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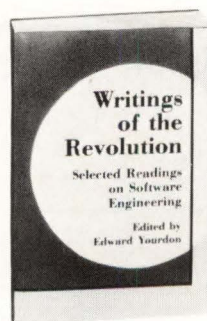
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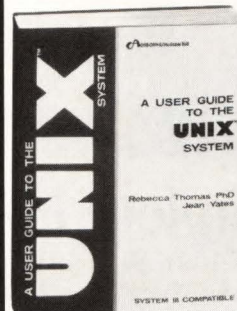


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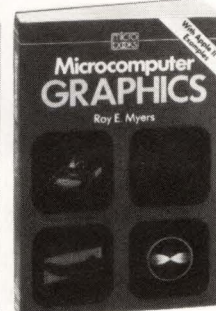


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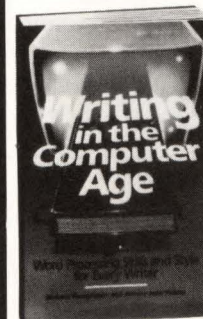
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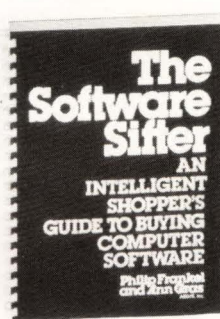
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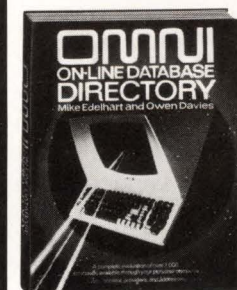
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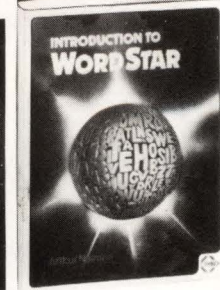
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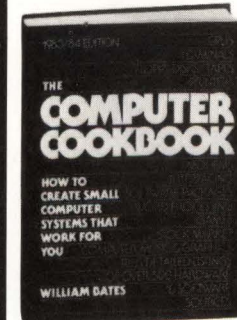
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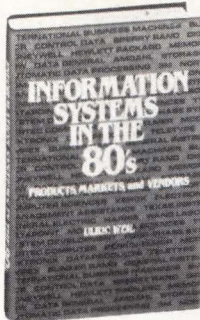
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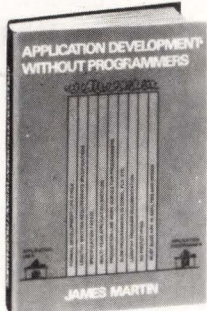
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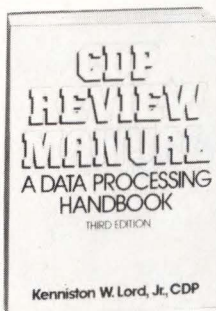
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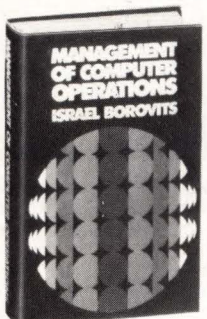
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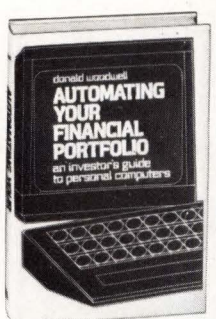
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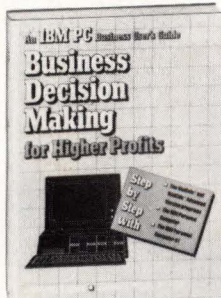
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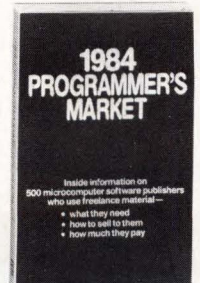
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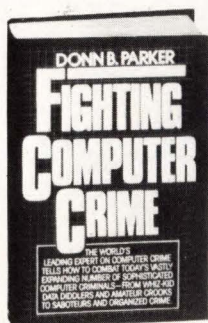
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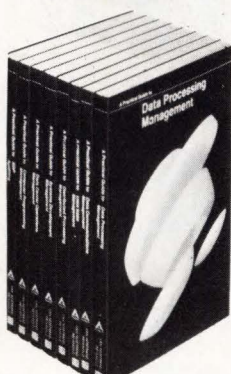
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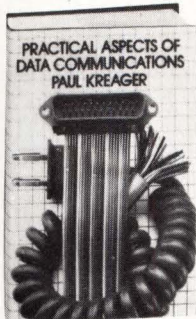


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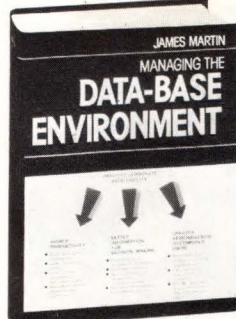


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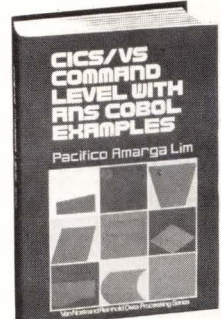
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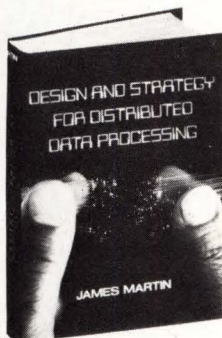
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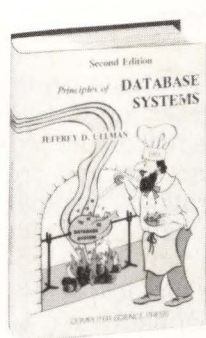
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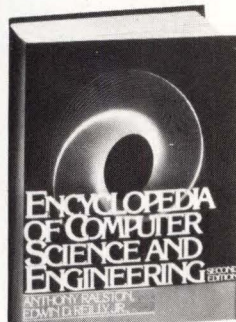
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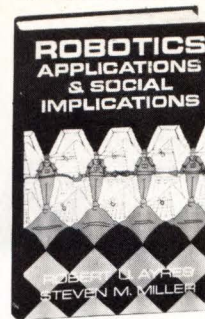
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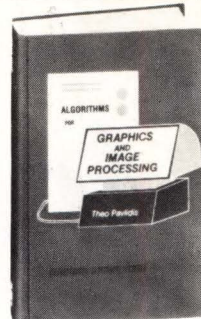


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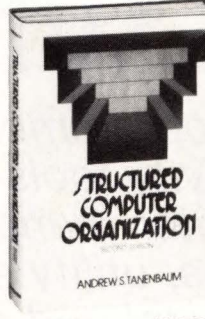
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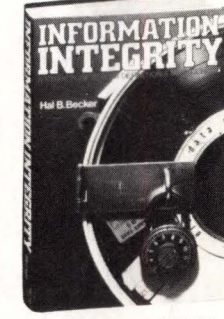
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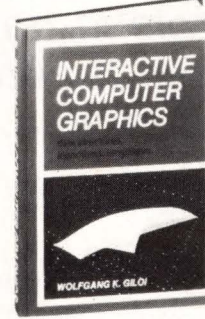
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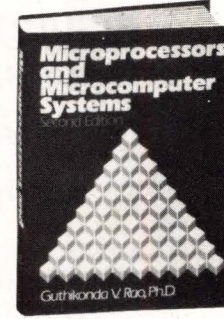
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Computer Decisions 4/84

SOFTWARE CELEBRATION PART 1, UTILITIES

From programmer-productivity tools to data-center-management packages, utility software plays a vital and often unsung role in data processing. It automates the unautomated.

by Jan Snyders, Midwestern Editor

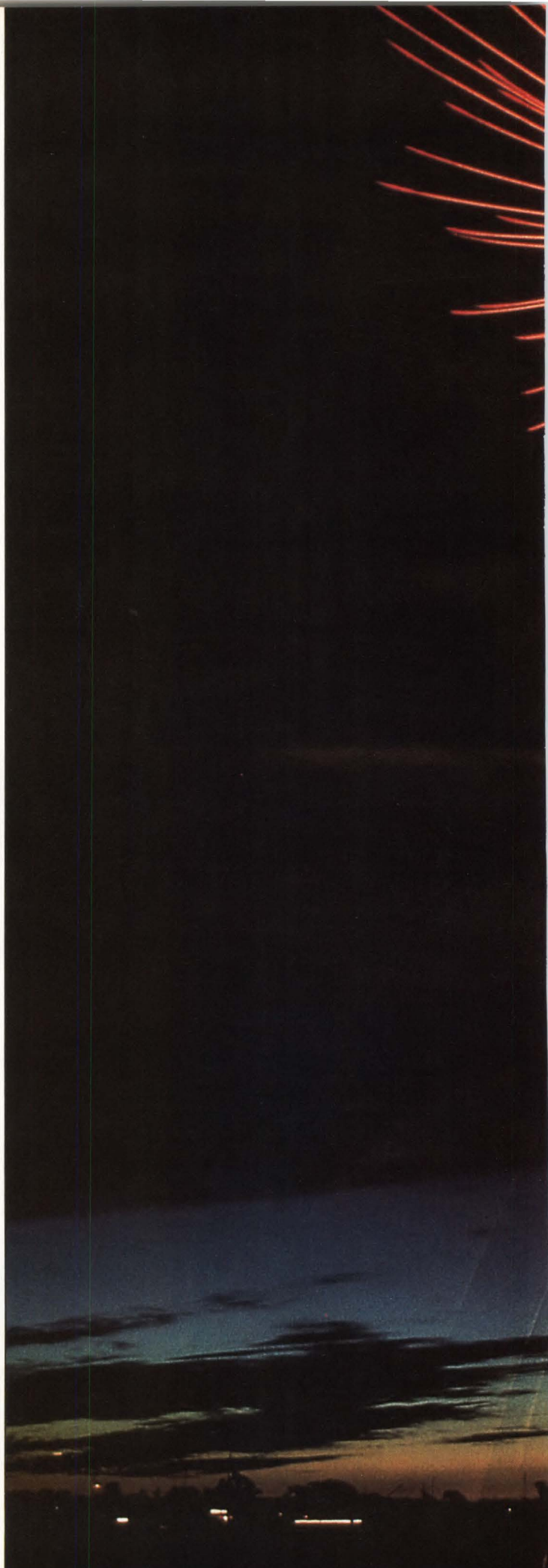
Utility software plays a unique role in a data center, performing many of the mundane tasks left unautomated by automation. Organizations rely on the wide variety of management, database-access, and programming packages to keep operations humming despite ever-growing demands for data-processing services.

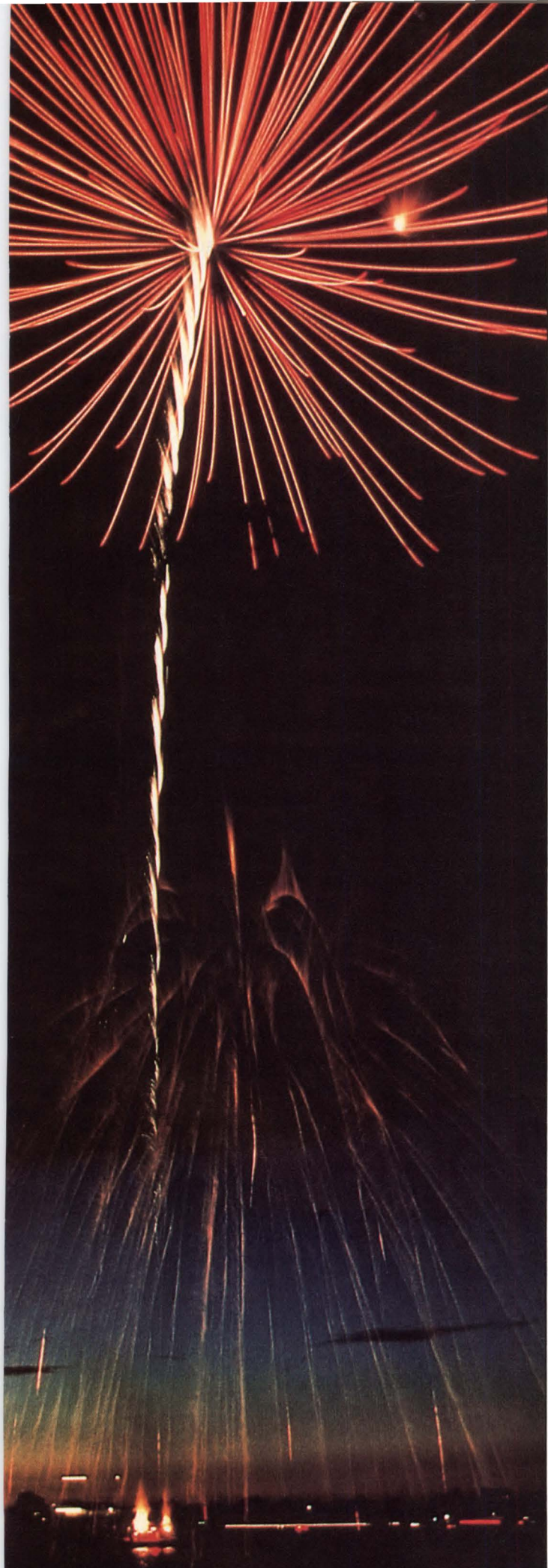
The vignettes of user experiences that follow are a celebration not only of the individual packages, but also of the search for more functional and efficient information systems. *Computer Decisions'* showcase of software successes gets bigger every year, even though we keep narrowing its scope. We've limited it to packages that run on the IBM 43XX series and larger mainframes and on plug-compatible mainframes (PCMs). This month's installment covers utilities; next month, we'll look at applications software.

In addition to the two-part software showcase, *Computer Decisions* regularly contains reports on mainframe software—in feature articles like "Software for a smooth-running data center" (January) and "DBMS: The more you get, the more you want" (February), in my monthly "Snyders on software" column, and in the new-product section at the back of every issue.

The past year has witnessed a significant number of mergers among independent software suppliers, but the number of packages has not undergone consolidation. To the contrary, the number of offerings continues to grow. With so many to choose from, finding the right packages to meet your organization's needs can be a formidable task. However, the alternative is

Photo by Chuck O'Rear/Westlight





usually more manual labor by programmers. As the success stories that follow demonstrate, the savings of time and money that utilities can provide make the effort of finding the right ones worthwhile.

The most obvious place in the data center that utilities work their cost-cutting magic is in the programmer pool. Increasing the productivity of highly paid programmers and systems pros is a continuing concern and one that can be addressed with the help of a utility package. Centex Corp., a Dallas-based conglomerate, installed User Files Online (UFO) from Oxford Software Corp. to hike the productivity of its dp staff. "Using UFO, we've doubled the speed of online development projects," says Hal C. Bradford, manager of systems and programming.

Centex, a construction, manufacturing, and energy-production conglomerate, had 1983 sales of \$869 million. Until UFO was installed two years ago, Bradford's staff programmed the corporation's IBM 4341 running Customer Information Control System (CICS) using only command-level coding. Centex had a programmer-productivity tool—IBM's Development Management System—for a year before switching over to UFO, but Big Blue's package was hampered by some fundamental limitations. For example, DMS isn't completely online, and UFO is. DMS requires a high degree of sophistication, while UFO is a nonprocedural package that requires no special knowledge of command-level programming. UFO also simplifies screen design.

Like many similar packages, UFO shortens the application-development process by bringing users into it. "UFO gives the user direct responsibility for the integrity of data and the documents from which they are extracted," says Bradford.

Under the old system, the average development cycle was six months long, and users weren't always satisfied with the way data processing translated their requests into programs, says Bradford. "Now, we sit down with a user and design screen layouts right on the spot," he says. "Right then and there, we ask if a proposed solution meets the user's need. After the design session, we turn out the application within three weeks."

UFO also speeds program maintenance, says Bradford. "Our online payroll system, which processes up to 6,000 paychecks each week, requires continual changes," he says. "UFO makes the changes easy to perform, and it has a 'help' facility that makes it easier to generate documentation."

Bradford won't quantify the savings Centex has achieved with UFO, but he says savings aren't the point. "We bought UFO to improve our responsiveness to the users," he says.

UFO for CICS shops costs \$24,000 for DOS-based systems and \$33,000 for OS-based systems. A version for IMS/DC (under OS) costs \$60,000.

Circle 879

(Continued on page 138)

Software Celebration

(Continued from page 137)

Pushing systems to the limit

Bank customers are seeing many changes in the services available to them and the ways they are provided. Automatic teller machines (ATMs) and online access to account balances are among the most widely available

new bank services. Inside the banks, however, these conveniences mean greater demands on data centers. "More customer services, including ATMs and branch automation to provide all tellers with online access to data require increased data-processing capabilities," says Gerry Taylor, systems programmer at Mellon Bank, Pittsburgh. Often, banks are

prompted to make unnecessary or premature investments in new hardware and personnel to cope.

Mellon Bank confronts this capacity squeeze with CA-Optimizer from Computer Associates International Inc. In addition to internal applications, the bank also does data-processing for more than 200 customer banks. This expansion into a new

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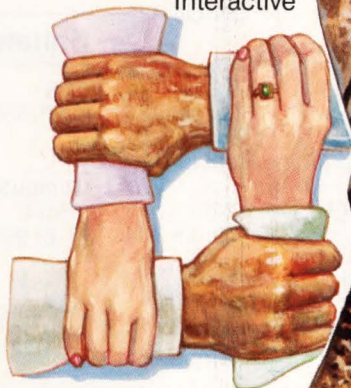


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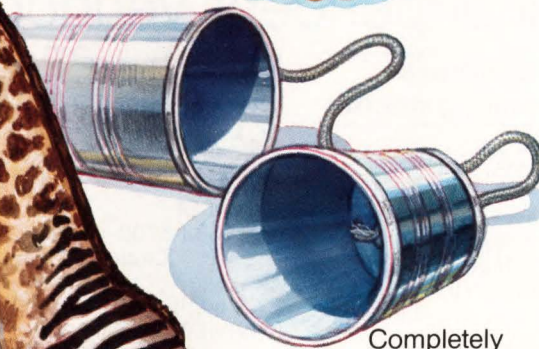
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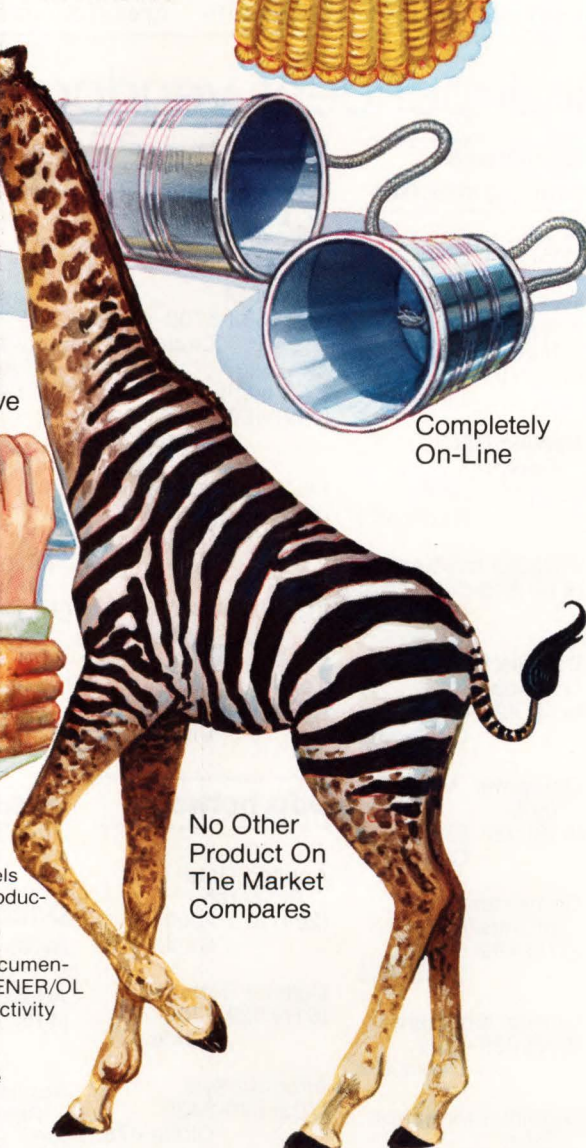


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Software Celebration

(Continued from page 138)

market for the bank—computer services—places an ever-increasing workload on the applications-programming staff, says Taylor. "Our workload is about 200,000 jobs a month, so programmer productivity is critical," he says. "We wanted to raise productivity without having to expand our hardware. The most economical solution was to raise the effi-

ciency of our existing systems."

Mellon Bank, with assets of \$19 billion, has 300 applications programmers and expects to hire more. It has five mainframes—three IBM 3081s and two 3033s.

CA-Optimizer eliminates redundant Cobol instructions, decreasing processing time and therefore increasing program throughput.

"During the first year, we saw a 15 percent to 20 percent savings in processing capacity in the affected programs," says Taylor. The package helps the staff generate "smaller and faster" programs, he adds.

CA-Optimizer has two particularly useful features for applications programmers, says Taylor. First, the Detector translates program prob-

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Software Celebration

(Continued from page 140)

lems into plain English, aiding in problem solving. Program debugging is simplified by the feature. The Detector also reduces paper costs. Second, the Analyzer feature tests each line of code—guaranteed. Testing occurs before the programs are run in production. The feature also locates which portion of the programs uses the most central-processing-unit

(cpu) time. "We use the Analyzer to fine-tune our programs," says Taylor. "In some cases, a rearrangement of instructions has significantly reduced a program's cpu-time consumption."

Optimizer runs on the IBM 360, 370, 43XX, 30XX, and PCMs. It costs \$15,000 in a DOS version, and \$32,000 for OS-based systems.

Circle 880

This utility earns its keep

Strictly speaking, documentation software is not classified as a productivity tool. But John LaFare, vice president of systems technology for Security Pacific National Bank (Los Angeles) believes it should be. Flow-

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Software Celebration

(Continued from page 142)

charter from Diversified Software Systems Inc. saves his employer \$100,000 a year by speeding the documentation process. Security Pacific has assets of more than \$37 billion.

Before Flowcharter was brought in during December 1982, Security Pacific's development staff was hampered by out-of-date documentation and slow documentation preparation by the central documentation library.

(Documentation for production systems, commonly called run books, is stored in this library.) According to LaFare, the problems had several causes, all leading back to the library.

"A routine audit in early '82 showed that our documentation was sometimes out of date," he says. "Programmers complained that documentation updates took too long to complete—up to an unacceptable

several weeks. Lastly, the workload for our central documentation library administrators was unbearable. They simply couldn't generate documentation fast enough."

The audit revealed that many of the administrators' tasks were of a clerical nature, says LaFare. The single most time-consuming task was drawing flowcharts. The bank's dp staff had three options to eliminate

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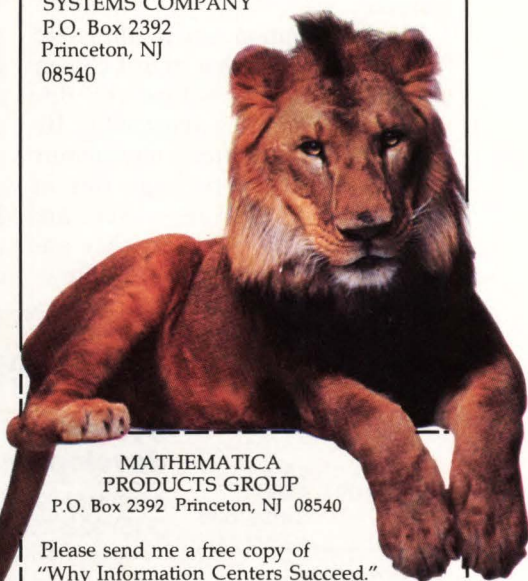
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CD-4

Software Celebration

(Continued from page 144)



"Conservatively, Flowcharter saves us \$100,000 a year by speeding up the documentation process." *LaFare, Security Pacific National Bank*

this bottleneck. First, flowcharts could be eliminated. However, these charts are valuable for planning and analysis of system utilization. Second, the bank could hire more documentation administrators. This option would not be cost-effective, however.

The third option was to automate flowcharting. Flowcharter was chosen and put into use before the dp-standards committee approved it. By the time the committee's imprimatur was obtained, the package was in wide use, says LaFare. "Users are prompted by the package, they answer a few questions, and Flow-

charter takes care of the rest."

One hundred thousand dollars is LaFare's "conservative estimate" of the value of the time and effort Flowcharter saves the bank's documentation administrators. Their productivity has been increased, he says. "These savings don't include the improved productivity of our 400 programmers," he adds. "Previously, they executed the initial flowcharts during system development. Now, the whole process has been speeded up."

Flowcharter, which sells for \$7,000, runs on IBM mainframes under the OS and VS families of operating systems. *Circle 881*

Structural aid

National Fuel Gas Distribution Corp., Buffalo, NY, turned to a different kind of tool to boost the productivity of its programmers. Structure(s), from Ken Orr and Associates, automatically generates program diagrams, charts, and designs, reducing the time needed to create, maintain, and document software systems. It is used by analysts, designers, programmers, and documentation librarians at the utility company.

National Fuel Gas serves 750,000 ratepayers in western New York State, the Northern Tier region of Pennsylvania, and eastern Ohio. It has an 8-Mbyte IBM 4341 accessed by 265 IBM 3270 terminals. National Fuel has used a data-structured approach to programming for some time, says Ed Gianni, senior systems analyst. About three years ago, he learned about Orr's Data Structured Systems Development (DSSD) method, which is the heart of Structure(s), the programming aid.

Gianni and his staff have been using Structure(s) to design and produce a plant-accounting system taking in the utility's fixed assets. "It is a large-scale development project," says Gianni. "We've used the package every step of the way." In the design phase, for example, Struc-

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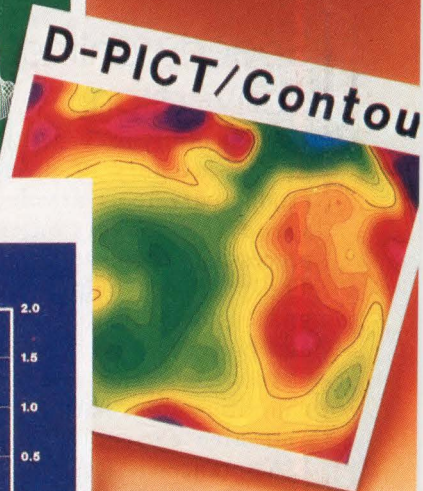
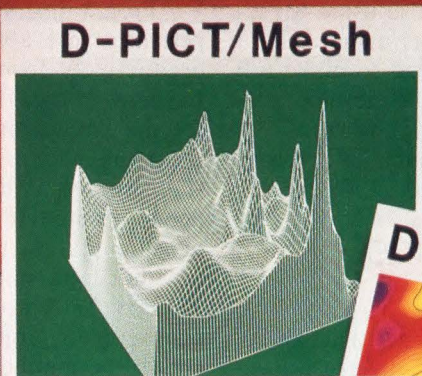
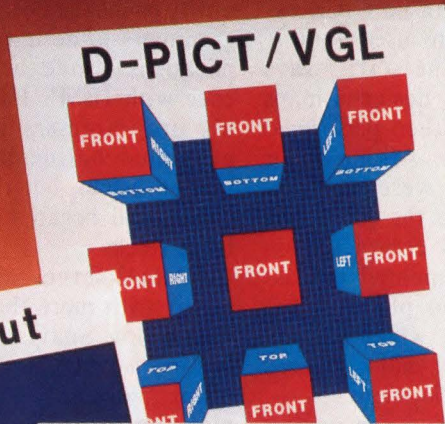
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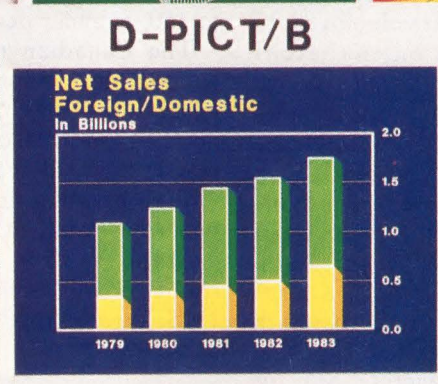
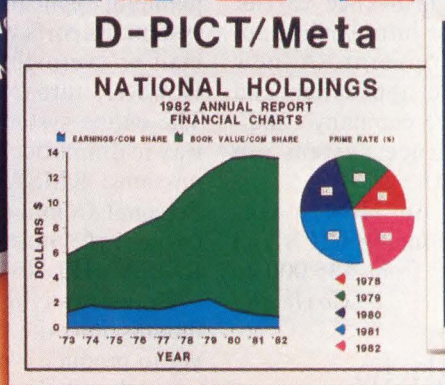
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Software Celebration

(Continued from page 146)

ture(s) allowed the 15 contract programmers hired for the project to create diagrams and modify them with a minimum of hand drawing. "We are not only performing our work more quickly, but also more effectively," says Gianni. "Structure(s) improves our program designs."

Gianni's team is also using Structure(s) to put together a simple data dictionary. "We intend to make full use of Structure(s) to develop program models, as well," he says.

Structure(s) is machine-independent. It costs \$16,000. *Circle 882*

Speedy online conversion

Many utility packages that fall into the category of programmer-productivity tools are deployed to speed the conversion of batch-processing systems to online systems. The packages help programmers unaccustomed to online languages and procedures overcome their lack of knowledge. That saves the user organization from having to seek out and hire expensive specialists. L'Assurance-vie Desjardins, a large Canadian insurance carrier based in Levis, Quebec, installed Mark V from Informatics General Corp. for this purpose.

The package was installed last summer during the conversion of a large-scale pension system from batch processing and the creation of new online applications. The pension plan covers about 20,000 members of Caisses Populaires, a Quebec-based network of credit unions with more than 1,000 branches. The information-systems department at L'Assurance-vie Desjardins uses an IBM 4381 with CICS and the DL/1 database running under the DOS/VSE operating system.

"The problem was that Data Management System (DMS), IBM's CICS online application generator, was so complicated that most of the programming staff couldn't use it," says Leopold LeClerc, database administrator. A faster, easy-to-use application generator was needed to

complete the pension-system conversion on time. The data center needed to complete 43 screens for the new system by the end of the year.

Three of the nine programmers assigned to the new pension system had worked with CICS before, and they gave the others guidance using Mark V. "Programmers with no CICS experience were able to use Mark V productively from the start," says LeClerc. "First, they designed maps for the screens and then performed the logic operations. After two or three months, they were all competent enough to do the job." The pension system was completed on schedule and implemented on last January 1. A second phase of the pension-plan project, which will increase the number of online screens to 150, is under development.

The Canadian insurance carrier will use Mark V for future online applications development. A new disability-insurance application and new portions of the company's individual life-insurance system are under development.

Mark V runs on IBM mainframes or PCMs running CICS and IMS. Prices range from \$35,000 to \$100,000. *Circle 883*

From batch to online in six months

Retail Merchandising Services Automation Inc., a Riverside, CA-based service bureau for clothing retailers, installed Accolade, an application-development utility from

Multiplications Inc., to speed a batch-to-online conversion.

Steve Brown, director of systems programming, credits Accolade with cutting a year off the conversion time. "My original estimate for the conversion was 18 to 24 months, but we did it in six months," he says. The utility package allowed RMSA's programmers to design screens and applications despite their lack of experience with IBM's CICS. Brown and his programmers had never programmed online before the conversion began, but they learned Accolade and began working online in three weeks.

RMSA serves about 1,000 retailers with more than 80 field merchandising analysts. The analysts had been processing their merchandising-, inventory-, and purchasing-planning applications using the batch system. Reports were sent via express mail or overnight courier to clients. However, turnaround was too slow. The online system was planned as a way to dramatically speed data transmissions. RMSA's clients use IBM Personal Computers to send and receive information to and from RMSA's IPL 4443 mainframe.

Brown and his staff were seven months into the conversion and had yet to produce a production program when Accolade was installed. After the installation, they sailed through the conversion, completing it 10 months ahead of schedule. Besides helping them adjust to the demands of CICS Cobol, the package also automatically generates documentation, another big time-saver.

Accolade is available in a DOS/VSE version for \$28,000, and an OS/MVS version for \$39,000.

Circle 884

Providing better user support

Many organizations are involving users in information processing as a way to improve productivity. Success often depends on giving users the proper support and training—requirements that can overload al-





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Software Celebration

(Continued from page 148)

ready overworked data-processing departments. Metropolitan Life Insurance Co. (New York), one of the nation's largest carriers (1983 revenues: \$9 billion), freed more staff time for user support by automating certain software-maintenance chores.

Metropolitan Life installed Komand from Pace Applied Technology Inc. to replace existing data-collection and reporting systems. "The packaged accounting and chargeback system gives staffers more time to work with users," says Donald G. Carlson, systems consultant. "The vendor, not our staff, handles maintenance and upgrades of the software." Komand includes data-center accounting, data-inquiry, resource-billing, and Virtual Machine-charging-interface utilities.

Metropolitan has huge information-processing facilities, including 16 IBM mainframes in five computer centers in North America running MVS, CICS, the Time Sharing Option (TSO), and VM (Virtual Machine). The volume of information and operations is substantial. "Every day, we accumulate 20,000 online, interactive jobs and 10,000 separate 'log-ons,'" says Carlson.

Metropolitan Life's transition to the new system could have been ar-

duous, but Pace supplied source code and that made life easier. "We had to modify features like table sizes and user-record acknowledgments in the Komand package," says Carlson. "But because we had source code, these modifications didn't present a problem." The modifications facilitated Metropolitan's ability to track usage of its online system.

Along with Komand, Metropolitan Life installed DIS, an ad hoc report generator. Using DIS, a user can query databases from a terminal using simple commands. "The dp staff still has to design and write program subsystems," says Carlson. "But the users have become very familiar with the reporting system and are quite satisfied." Right after the system was installed, Carlson recalls, it was demonstrated to the operations-support staff. "Once their curiosity was stimulated, they began to think about how they could answer many questions. They have since attained significant productivity gains."

The data-processing staff uses the package to generate reports on usage of the carrier's online systems. Before the new packages were installed, they were unable to pull out reports on who was using the system at any given time.

The Komand systems range in

price from \$2,500 to \$16,000 and run on IBM 370, 43XX, and 30XX mainframes. *Circle 885*

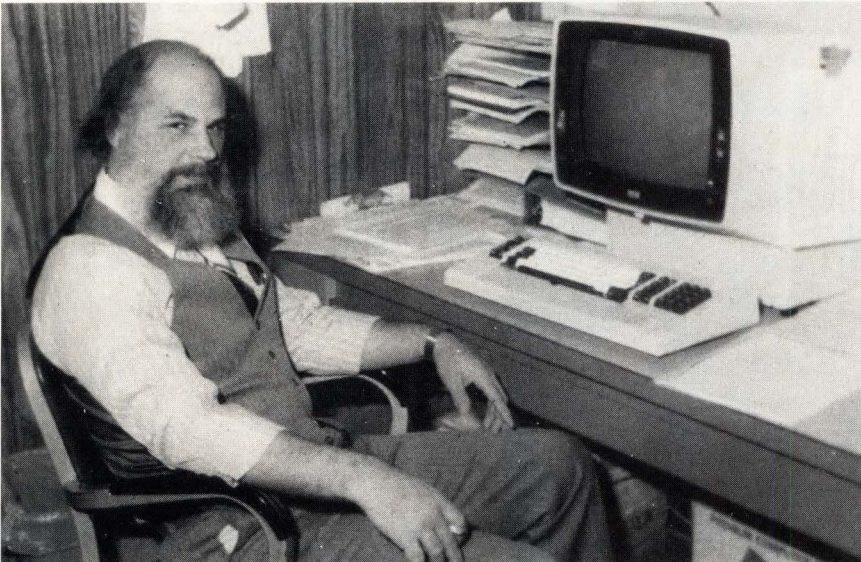
"Painted screens" speed data entry

Pfizer Corp., a New York-based manufacturer of chemicals, pharmaceuticals, and consumer products with 1983 sales of \$3.2 billion, installed a utility not only to bring users into its system, but to make them more productive. The Keyfast online data-entry system from H & M Systems Software Inc., coordinates the work of data-entry clerks and other users in offices all over the country, and has enabled Pfizer to reduce its programming staff by 16 percent.

Keyfast was installed in January 1982 to replace IBM's Video 370 in Pfizer's Groton, CT, data center. Networked IBM 3278 terminals are linked to an IBM 4341 in Groton.

Keyfast was installed because users could deploy it without yelling for the help of the dp staff, says Bernie Marttila, dp manager for Pfizer's chemical division. "We needed a package that could be used by all of our locations without creating new demands for support by the dp staff in Groton," he says. The same formats and screens are used throughout the corporation's locations, and Keyfast's extract utility gathers them, edits them, and incorporates them into applications programs.

The most outstanding feature of the utility, says Marttila, is a "paint" function for designing data-entry screens. The feature made conversion to the new system very easy. "We simply generated a hard-copy version of our old data-entry screens and 'painted' identical Keyfast screens," he says. New applications are easy to implement—new formats can be "painted" on the screen without the help of programmers. The data-entry supervisor, who was given training on the system, now designs and produces the necessary screens. Because users have taken over some of the workload, Pfizer was able to consolidate



Pfizer's revamping of its data-entry system using the Keyfast utility allowed the manufacturer to trim its programmer staff by 16 percent, says Bernie Marttila, dp manager of Pfizer's chemical division.



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Software Celebration

(Continued from page 150)

its programming staff, achieving staff reduction and attendant savings, says Marttila.

Keyfast runs on any IBM mainframe under the DOS or OS operating systems. Prices begin at \$8,000.

Circle 886

A healthy dose of information

A data-analysis package was brought into the Lutheran General Hospital, Park Ridge, IL, to improve the management of facilities and materials. "I wanted the information center to give managers access to data for strategic decision-making," says Paul Stutzman, systems programmer. "We chose SPSS-X [from SPSS Inc.] for statistical analysis to meet this goal."

Lutheran General Hospital is one component of the Lutheran General Health Care System, which also includes day-care centers, nursing homes, counseling centers, and a health-consulting service. Lutheran General has doubled in size, to 703 beds, during the last 25 years. Statistical analysis helps hospital managers maintain high standards of care. By analyzing data on surgical cases, pharmaceutical-effectiveness reports, cost reviews, budgets, and the like, administrators get a better idea of which procedures and medications work best, which departments are not cost-efficient, and how facilities can be fine-tuned to provide better services at a good price.

Management of materials, for example, is an important way to control costs. "We do user-satisfaction surveys, and use the results to identify ways to control costs," says Margaret Donnelly, assistant to the head of the materials-management division. SPSS-X helped shave close to \$70,000 from the hospital's annual linen-supply costs, she says.

Lutheran General budgets about \$1.3 million annually for linen services, but had no system with which to determine whether its money was well spent. Donnelly surveyed the hospital staff to determine just what

the practices of nurses were. "A nurse might be giving a patient six washcloths," she says. "There's no need for that." Using the survey results, supervisors identified ways the hospital's linen use could be reduced. The bottom line turned out to be a saving of one pound of linen per patient per day—a saving worth \$70,000, says Donnelly.

The linen survey was so successful that other divisions picked up the technique, says Donnelly. Similar surveys were conducted for medical, surgical, and laboratory supplies.

SPSS-X is available for IBM mainframes under DMS, OS, and DOS; Digital Equipment Corp. VAX super-minicomputers running VMS; Honeywell mainframes under GCOS; and the Sperry 1100. It costs \$6,000.

Circle 887

Users help ease a crunch

D-M-E Co., a Madison Heights, MI-based subsidiary of Fairchild Industries (Germantown, MD), turned to its users to head off an impending backlog. Terry Socall, who was manager of systems and programming at

the time, foresaw big problems for his department and the company as a whole when his department was assigned to install a business-resource-planning system (BRP). Suddenly, Socall (who has since left the company) found himself confronting the prospect of having too few staffers to do too much work.

D-M-E, with sales last year of \$100 million, manufactures special mold bases, components, and related products for plastic-injection molding and die casting. The BRP project was designed to automate and link order entry, manufacturing control, job costing, and purchasing. Completing the new system on top of an already heavy workload threatened to ruin response time, recalls Socall.

Socall and a team of staffers decided to install a utility that would allow users to carry out their own requests for reports and related tasks using the company's IBM DL/1 database. D-M-E has an IBM 4341-2.

The utility chosen for the task was TSI International's Data Analyzer. The package gives users a way to access data without having to learn DL/1 concepts and codes and without the help of the programming staff. The system was installed in November 1982, and with only a few hours of training, users were pulling out sophisticated reports and requests.

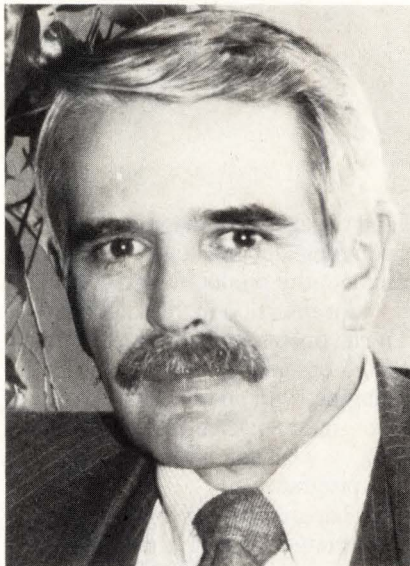
Freed of responsibility for running down user reports, the programming staff directed more of its attention to the BRP project, which was almost complete as this was written.

Data Analyzer runs on IBM 360, 370, 43XX, 30XX, and sells for \$22,000 in a DOS version and \$26,000 in a version for OS-based systems.

Circle 888

User center as dp department

As envisioned by IBM, the information center is a computing center for users that is supported by a data-processing department. Coast Federal Savings, Granada Hills, CA, has



Dyl-280 allows an information-center staff at Coast Federal Savings to double as the savings and loan association's data-processing department, says Alex Simpson, center director.



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Software Celebration

(Continued from page 152)

extended the definition of an information center, however, by making its new one a data-processing department as well as a user center. About 80 percent of the user requests for dp services are handled by the information center.

The center was opened last July. Files are offloaded by the bank's service bureau in Fresno and loaded at the savings and loan association's headquarters in Granada Hills by information-center staffers. The staff of one manager and three user con-

sultants is performing a growing number of dp chores, offsetting about \$20,000 a month in service-bureau charges.

Dyl-280—Dylakor's utility, manager, and report writer—is considered essential to the information center at Coast Federal. "We do everything using Dyl-280," says Alex Simpson, information-center manager.

Coast Federal has more than 100 branches throughout California and about 2,000 employees. The information center is built on the foundation of an IBM 4341 and Dyl-280. Other similar packages were evaluated, says Sondra Green, one of the user consultants, but none of them offered either the cost advantages or the functions of Dyl-280. Dylakor's package allows information-center staffers to easily process the loan master file delivered by the service bureau. The package also simplifies programming by eliminating recoding for oft-used routines.

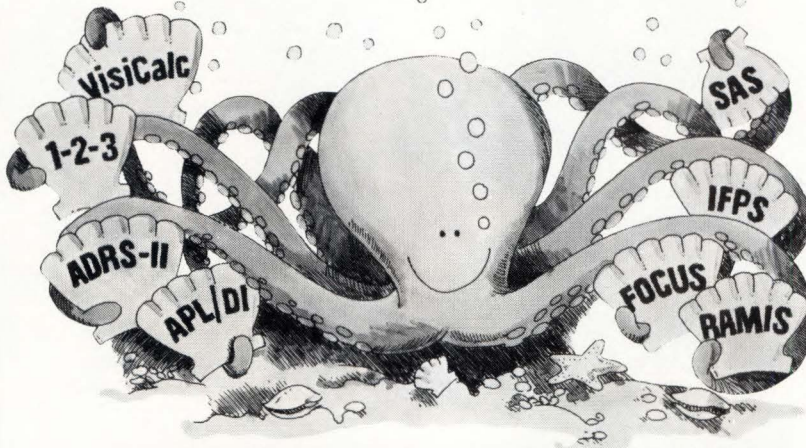
Dyl-280 runs on the IBM 360, 370, 43XX, and 30XX. It costs \$1,680 per year on a five-year lease. *Circle 889*

Orchestrated growth

The components of a growing computer network require constant care, and some utility packages help management provide it. Three years ago, the Sun Co. Inc., the giant Wayne, PA-based energy producer (\$16 billion in 1983* revenues), installed UCC-8, a data-center-management utility from University Computing Co., to coordinate the growth of its expanding computer network.

Data-center-management utilities automate several chores, including disk and tape management, resource planning, and scheduling. Others, like the one installed by Sun Co., oversee the operations of a far-flung information-processing network. "As our network grew and our requirements expanded, we were having a tough time bringing our systems up to date simultaneously," says Bill Fore, manager of Sun's data center in Dal-

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Software Celebration

(Continued from page 154)

las. "We knew that only a completely automated system could integrate our procedures for updates and maintenance."

At the time, information was processed at Sun through a hodgepodge of manual and automated systems.

"Some of our customer-address files were contained in a Rolodex card file," recalls Fore. "We also had sophisticated online systems to handle availability reporting, software-bug management, and change-request tracking." As the online services of-

fered by Sun's data-processing staff expanded, however, something had to give. Today, Sun's Dallas computer center comprises an IBM 4341, a 3381, and several 3033s, and provides a spectrum of services based on IBM's MVS and VM facilities to more than 5,000 terminals.

UCC-8 helps the data-center staff keep up with escalating user demands and network growth. "It lets us manage by procedures, instead of by our gut feelings," says Fore. UCC-8 provides an online customer and problem-solving database, as well as systems for tracking system failures, user requests, network and telecommunications problems, and scheduling.

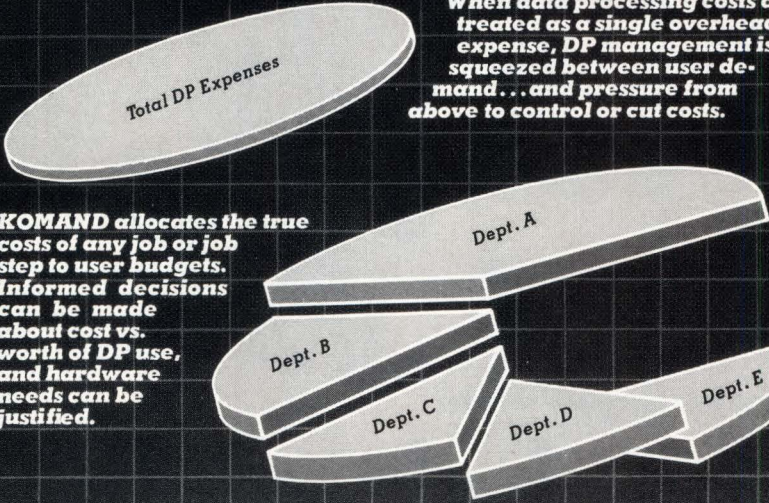
UCC-8 runs on IBM mainframes under OS, MVS, and VSI. It costs \$40,500. *Circle 890*

Utility keeps airline flying high

An airline can't remain aloft very long without support from its computers. For the last 30 months, Republic Airlines, a Minneapolis-based carrier serving 170 cities, has been upgrading its vital computer network from an IBM 370/168 and two 30XX mainframes to a 4341, a 3033, and two 3081s. A utility package has been helping out with capacity planning and performance analysis.

MVS Integrated Control System (MICS) from Morino Associates Inc. was installed just as the growth of Republic's computer facilities began. "It's hard to forecast your needs when you lack a good basis from which to measure," says Mike Knudson, performance analyst. "We're trying to correlate software releases on all of our computers, we're changing over from [IBM] 3330 to 3380 disk drives, and we're constantly fighting fires as we struggle to keep our service highly responsive to users."

Republic, with 1983 sales of \$917 million, uses its computers for a gamut of services and support tasks, including reservations, aircraft maintenance, flight planning, and pilot in-



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CIRCLE 81

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CIRCLE 82

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Software Celebration

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formation. Equipment-maintenance applications are particularly vital, both to the profitable operation of the airline and to its ability to meet Federal Aviation Administration safety requirements. "We can't afford to ground a \$20 million aircraft because

a mechanic can't get information from the computer about a 15-cent part," says Knudson.

From a data-center management standpoint, Knudson has a seemingly endless list of applications for MICS. "We use it for system planning, to

examine channel utilization, to figure out where to put a string of new disk drives, to determine how to best set up a new processor. . . . In some cases, we've used it to spot transaction codes that were overusing resources," he says.

MICS, which runs on the IBM 370, 43XX, 30XX, and PCMs, sells for \$28,600. *Circle 891*

The securing of First Tennessee

During the last year, the security of large computer networks has become an urgent issue—particularly after revelations about computer hackers penetrating government and private computer facilities using commonly available equipment and transmission services. Some data-center-management utilities attack this problem, enhancing the confidentiality and safety of vital data. First Tennessee National Bank N.A. (Memphis) turned to one such package to enhance the security of its network.

First Tennessee National Bank, with assets of \$4.6 billion, has two IBM 3083J mainframes in its Memphis data center and six remote centers that provide data-processing services to 130 correspondent banks in four states. "We were using a host of security methods to protect our data," says Bob Wicksell, manager of data security. "This conglomeration resulted in good security, but it wasn't centralized. The different approaches created conflicts in standards and training."

Wicksell solicited and received the blessings of top management to consolidate security under a single system. The bank needed a security utility that was invisible to the operating system, could be gradually implemented, and required minimal maintenance. Wicksell chose Top Secret from CGA Software Products Group and installed it on a Saturday in November 1982, in time to include new distributed-data-processing equipment under the security net.

(Continued on page 195)



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PIE:Writer:	Apple II, IBM PC	\$149.95 \$199.95	84 1/4
WordStar	CP/M†, Apple II, IBM PC	\$500	80
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BUILDING UP YOUR PERSONAL COMPUTERS

PART III: STORAGE DEVICES

Are users stocking up on storage because prices have plummeted so rapidly, or have manufacturers lowered their prices in response to the surging demand? Either way, users are clamoring for more mass storage.

by Rick Cook

Photo by Bob Ward



Remember when two 8-inch floppy disks containing 250 Kbytes of formatted storage were more than any business needed for its personal computers? How quickly users' demands have grown. Only a couple of years ago, a 5-Mbyte Winchester hard disk

was considered copious. And last year, IBM claimed its PC XT—with its 10-Mbyte hard disk and ability to reach 20 Mbytes with a second disk—would satisfy those users most hungry for storage. Yet users continue to complain: "We need more storage."

And as the need for storage skyrockets, prices are taking a nose dive. Users paid \$2,000 to \$3,000 for 5 to 10 Mbytes of hard disk a year ago, and pay from \$1,000 to \$2,000 for 10 to 20 Mbytes today. As prices drop further, more and more users may opt to triple their storage capacity, whether they need to or not.

The demand for mass storage shows no signs of slowing down. Walker Mannes, an industry analyst for Creative Strategies International, a San Jose, CA, consultancy, predicts a steady growth in the storage capacity of hard disks on personal computers. He expects the present storage capacities of 5 to 10 Mbytes for most hard disks to jump to around 50 Mbytes this year.

Even with those capacities, vendors

will have trouble keeping up with users' needs. Already, multi-user systems and networks of personal computers frequently use more than 100 Mbytes of storage. Some corporations have gone so far as to power their systems with as much as 1,800 Mbytes, using special controllers. Other organizations opt to buy the 900-Mbyte Fujitsu Eagle drives and controller needed to put that much storage on single computers, but most can't justify such an expenditure of time and money.

Why are users calling for more and more disk space? Mannes partially attributes the phenomenon to multi-user systems. "Because of the 16- and 32-bit microcomputers being introduced, we're seeing more multitasking, multi-user systems running integrated software. Such systems require a lot more storage capacity."

The proliferation of local-area networks (LANs) is also increasing the demand for storage. Very high capacity disks are shared among networked personal computers, which often have their own hard disks, as well.

This thirst for storage may soon be quenched by disks incorporating a

(Continued on page 164)



When Memorex tested its new Thin Film Disc Drive Subsystem against the 3380, the results were so dramatic we decided to write a book about it.

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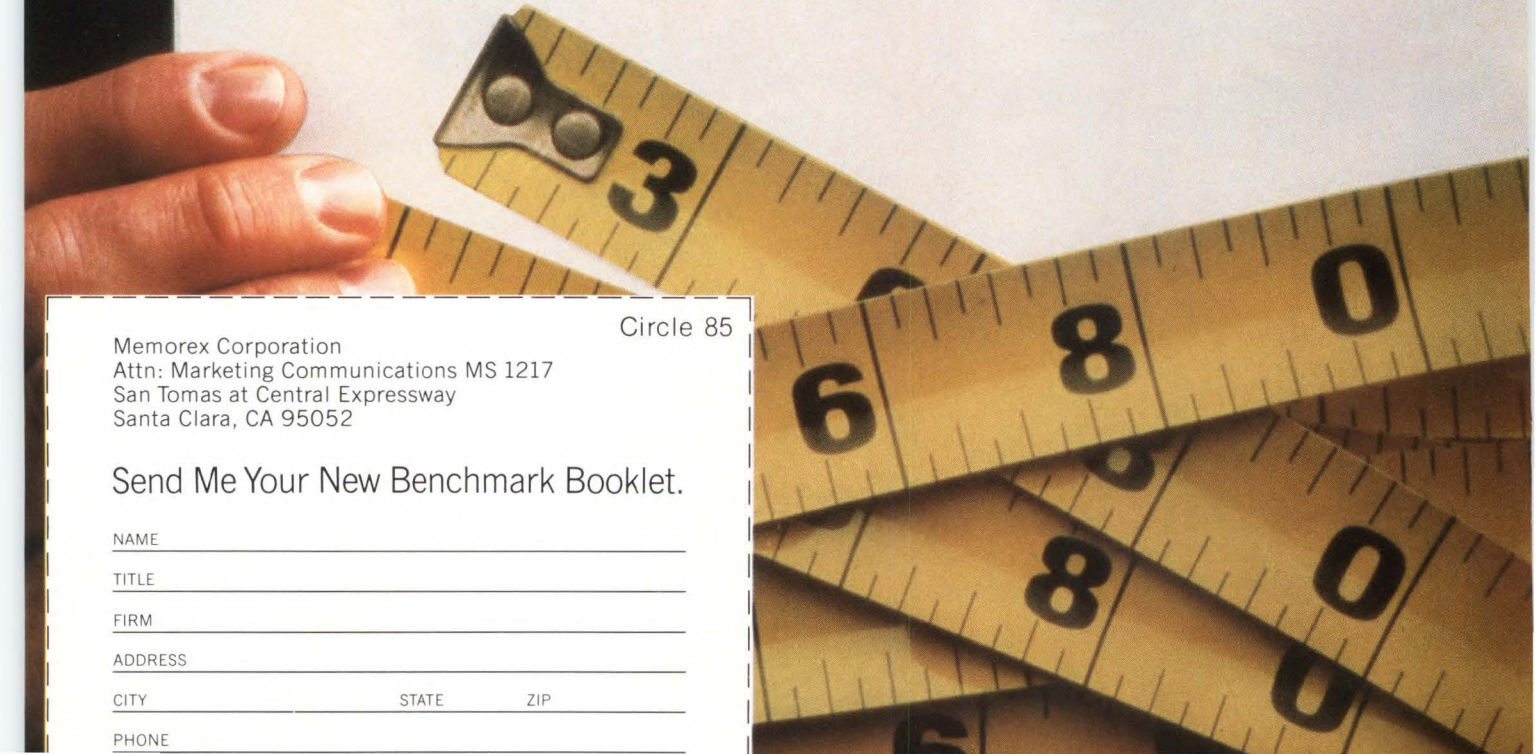
But the big news is the Benchmark tests that were executed to measure the throughput advantage enjoyed by the 3680. The Memorex 3680 ran head to head, I/O to I/O and Megabyte to Megabyte against the 3380. And the results, now available are bound to be a best seller.

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TO DISC DRIVE
PERFORMANCE EVALUATIONS



Personal-Computer Peripherals

(Continued from page 161)

variety of new technologies. There are probably more approaches to mass storage now than at any other time in the history of personal computers.

Mitsubishi has introduced a new 5¼-inch floppy that can record up to 2 Mbytes. It uses a special magnetic medium and has a very high bit density. Another vendor, Amlyn, is offering a 5¼-inch floppy that can find files more quickly than can other disks. When a user requests a particular file, the head in the disk's drive uses a special sensor to position itself over the right track. Drivetec has a similar disk system that uses a different kind of sensor.

This past November, 3M Corp. introduced a 5¼-inch disk drive that can store 5 Mbytes. 3M promises the drive will soon be storing as much as 100 Mbytes. And a number of manufacturers are developing vertical-recording techniques, which achieve extremely high storage levels by placing the magnetic particles on the disk surface vertically rather than horizontally.

All these different technologies are bound to cause compatibility problems, for none of the new drives can exchange disks with each other or with standard 5¼-inch floppy drives. Users of Mitsubishi's new disks have already reported problems in distinguishing between the new extra-high-density disks and some of the vendor's standard floppies. Both

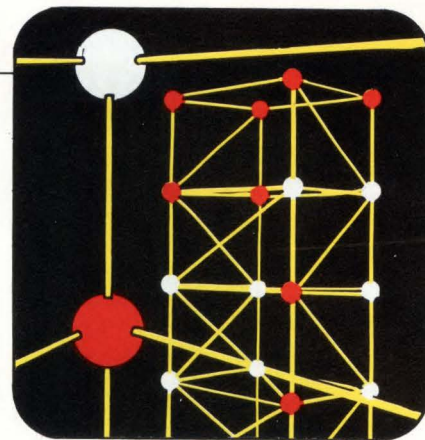
disks are described on their packages as containing 96 tracks per inch, and both appear to be identical—until users try slipping them into the wrong drive.

In general, you should assume that any personal computer that records more than 1 Mbyte on a 5¼-inch floppy uses a special medium. If you buy such a computer, pay close attention to the manufacturer's media recommendations.

Yet, it may be a while before the newest mass-storage technology will be used by enough businesses to cause much confusion. Not all these highly touted disks and their accompanying drives are available yet, and it may be a year or two before those that are heavily advertised will appear in offices. Because manufacturers of mass-storage devices sell to original equipment manufacturers rather than end users, new disk systems typically take two to three years after their introduction to become widely available in personal computers.

Users have been waiting even longer than that for bubble memory. Vendors of bubbles, which are tiny magnetic fields on a garnet chip, have promised for at least five years that these solid-state storage devices will entirely replace disks. But bubble memory is not yet widely used for general-purpose business applications.

The major reason many corpora-



tions don't use bubble memory has been price. At \$1,500 for 128 Kbytes of storage, the price of bubble memory is still too high for office applications. Prices are slowly dropping, but it will probably be at least two years before such devices are used in corporate personal computing. Several companies already offer bubble-memory boards, but these are sold almost entirely to manufacturers of industrial controls.

Another technology that is much discussed but little used is the optical disk—the ultimate in mass-storage technology. It promises to provide storage by the gigabyte—perhaps even the terabyte (1,000 gigabytes)—at a relatively low cost per megabyte.

On optical disks, a laser stores information by creating discontinuities on a highly reflective surface. The differences in reflectivity are read by a low-power laser that bounces off the surface. Like video disks, the first generation of optical disks will not be erasable. These disks may be useful for financial institutions, insurance

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Storex
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Circle 741

Tallgrass Tech.
(913) 492-6002
Circle 742

3M
(612) 733-2237
Circle 743

carriers, and other companies that need to blaze a permanent audit trail. But Mannes and other industry analysts say the optical disk will be of little use to most organizations until erasable versions appear in several years.

Shugart has announced a 1-gigabyte nonerasable optical disk, the Optimem 1000, for personal computers. The vendor says it is shipping evaluation quantities now and expects the product to be widely available next year. Some read-only optical disks, based on adaptations of video-disk players, may be available later this year. They'll be used to distribute large fixed databases among widely scattered computer systems.

Shugart says its optical disk acts as a shared mass-storage device for networked personal computers that use their own hard disks for short-term memory. Storage devices using the Optimem will probably cost between \$10,000 and \$15,000 when they become available from third-party manufacturers.

A new technology already being used is the disk emulator, or random-access-memory (RAM) "disk," a set of memory boards that emulates a disk drive. Like all available RAM, disk emulators are volatile—when power is zapped, so are the contents of the memory. But also like RAM, disk emulators are fast—they speed up applications typically slowed down by the need for frequent disk changes.

Another form of mass storage already in use is the micro-floppy disk. Micro-floppies are sub-5¼-inch disks that use more-or-less standard floppy technology to store the same amount of information as a 5¼-inch disk. They offer little or no performance improvements over 5¼-inch units. Some manufacturers claim micro-floppies are more reliable, but their main strength is that they let computer manufacturers make smaller and lighter portable computers.

Norman Thurn, manager of integrated management systems for the transportation business unit of Westinghouse Electric Corp., says

the hard plastic cases that come with the mini-floppies protect the disks better than the soft ones that come with standard disks. The company has about 400 personal computers and workstations tied in a baseband local-area network and connected to a number of mini and mainframe computers, including Hewlett-Packard 1000s and 2000s, DEC VAXs, Hitachi 9000s, and IBM mainframes. About 200 of those personal computers and workstations are equipped with Hewlett-Packard 3½-inch disk drives.

Last fall, Hewlett Packard announced it was using a 3½-inch micro-floppy in its HP 150 personal computer. Apple followed suit in January, putting a 3½-inch disk in its Macintosh and announcing that its Lisa workstation will also use micro-floppies. Owners of older Lisa computers with Apple's proprietary Twigggy drives will be able to get free retrofits.

So far, it appears that the 3½-inch disk will become the standard micro-floppy in this country. Several American computer manufacturers have agreed to use it, and most major disk-drive manufacturers have agreed to produce it. The popularity of the 3½-inch disk will increase dramatically if the Macintosh achieves the success Apple hopes it will.

Micro-floppies may be the wave of the future, but the double-sided, double-density, 360-K 5¼-inch floppy is still closest to a standard storage medium for personal computers. Users are demanding—more than size, more than fancy technology—increased capacity incorporated in this traditional medium. And manufacturers are beginning to meet this demand, offering personal computers with disk drives that accommodate from 500 Kbytes to 1 Mbyte of storage per standard floppy disk. "You'll see a steady increase in capacity on the 5¼-inch floppy," says Mannes.

Personal computers with capacities of up to 3 Mbytes probably won't be available in the near future. Disk drives that can handle all that storage incorporate newer technologies, and

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Personal-Computer Peripherals

(Continued from page 165)

manufacturers of personal computers have chosen to stick with reliable standards.

Another hindrance to the proliferation of high-capacity floppies is that older disk drives can't accommodate the new floppies. Although it's possible to re-equip computers by swapping drives, it's also expensive and risky. The new drives might not be able to read the software already developed for older units.

Independent vendors have responded to users' demands for mass storage on personal computers more quickly than have the major manufacturers, but they too are having trouble keeping up. "We have trouble finding vendors of integrated subsystems with disk and tape backup for systems with more than 200-M online storage," says Eric Murr, manager of microcomputer hardware for The Bekins Co., a Los Angeles-based conglomerate that owns Bekins Van Lines and other companies.

To squeeze more storage into existing computer designs, manufacturers are developing half-height hard disks. One of these will fit into the space for half-height floppies, and two will fit into the space of a single standard floppy. A number of manufacturers have also introduced 3½-inch hard disks that fit into the space for a micro-floppy drive. A couple of computer manufacturers are using them, but so far, not many have been sold. Mannes says their success will depend on sales of computers designed for 3½-inch floppies.

Along with the growing popularity of hard disks comes an increasing incidence of head crashes. Unlike a floppy, in which the read/write head stays in contact with the disk, the head of a hard disk flies above the spinning disk's surface, supported by aerodynamic forces. Typically the head flies less than the diameter of a human hair above the disk's surface. But sometimes it flies too high and

crashes with the spinning drive platter. When that happens, data get lost and the drive has to be replaced.

Shock, vibration, and power failure can all cause a head to crash, and that makes hard disks more vulnerable than floppies to accidents. A jar or a thump can be enough to send a spinning hard disk into a head crash. To guard against head crashes, manufacturers frequently shock-mount their disks, and users sometimes purchase uninterruptible power supplies.

Such complications have resulted in an ongoing debate over the advantages of using hard disks in portables. Many users of hard-disk portable computers, such as Kaypro and Compaq, report no problems, even in transporting their machines. The drives for portables are usually shock-mounted more carefully than those on conventional personal computers. Compaq, for example, uses a 3½-inch disk partly because the disk's

(Continued on page 167)

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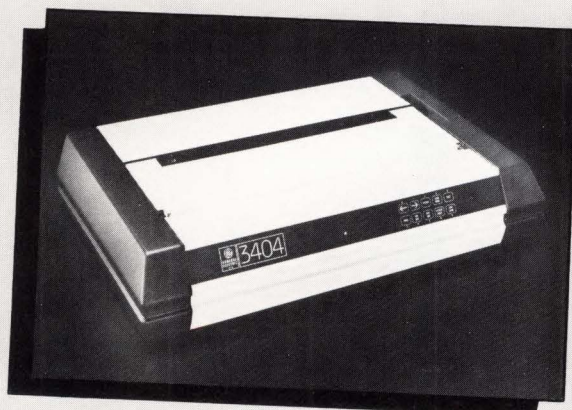
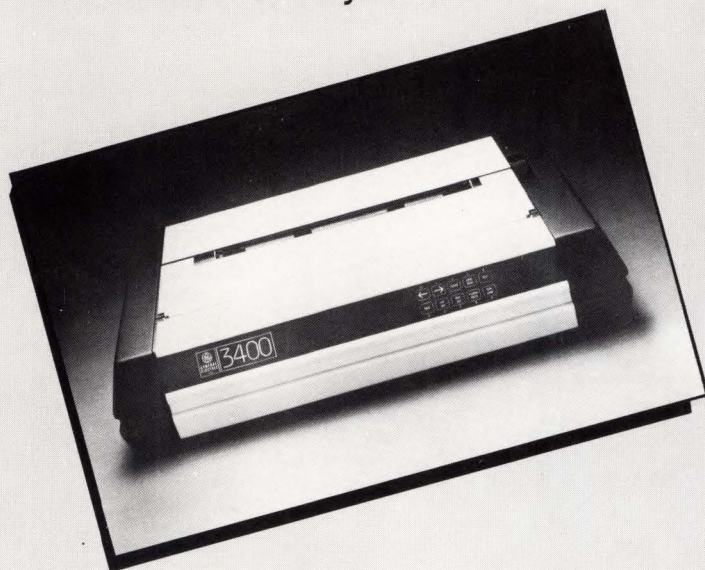
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Long-standing readers of *Computer Decisions* will notice that our annual teleprinter guide has donned a new look. Now a pullout booklet instead of a wall chart, the guide no longer includes comparisons of display terminals. A separate booklet on terminals will be published in the July issue.

The new, more streamlined format includes the use of a number of codes and abbreviations. To help you interpret the guide as easily as possible, a key that defines codes for printer types and that gives abbreviations is included on this page and again at the end of the booklet. The key also lists the types of measurements used for particular specifications.

Key

Printer types

BL = band line; CIJ = color ink jet; DM = dot matrix; DT = desk-top; DTM = desk-top multimode; DW = daisywheel; G = graphics; GLBC = graphics label bar code; HS = high speed; IJ = ink jet; IM = impact matrix; K = keyboard; KSR = keyboard send receive; L = line; LQ = letter quality; LQDM = letter quality dot matrix; LW = lightweight; M = modem; ME = memory; NLQ = near letter quality; PP = page printer; PR = printer; RO = receive only; S = serial; SM = serial matrix; SIDM = serial impact dot matrix; T = text; SP = spooler; TLBC = text label bar code.

General abbreviations

Char. = characters; cpi = characters per inch; cpm = characters per minute; HC = host controlled; IMP = impressions; Int. = internal; ips = inches per second; lpi = lines per inch; lpm = lines per minute; lps = lines per second; mm = millimeters; ppm = pages per minute; PW = printable width; SD = software dependent; SW = software controlled.

Individual specifications for units of measurement

1. Print method: B = belt; DW = daisywheel; IM = impact matrix; TM = thermal matrix; 0 = other.

2. Character format: Indicates dot-matrix density or if full font (FF).
3. Maximum print speed is in characters per second, unless otherwise indicated.
5. Printable character sets: number of characters.
6. Alternate character sets: number of sets.
7. Number of columns or inches of printable width.
8. Character spacing is in characters per inch, unless otherwise specified.
9. Lines per inch: All choices are included, PRO = program-mable.
10. Paper types: CF = continuous feed; CS = cutsheet; FF = fanfold; M = multipart; SH = sheet; SS = single sheet; T = thermal.
11. Minimum-Maximum paper width is in inches, unless otherwise indicated.
14. Paper drive: FR = Friction; P = Pin; TR = Tractor.
15. Line-feed time is in milliseconds, unless otherwise indicated.
16. Paper-slew rate is in inches per second, unless otherwise indicated.
17. Color printing: If available, number of colors is given.
18. Ribbon length is in yards, unless otherwise indicated; C = cartridge.
19. Ribbon characteristics: A = autoreversing; CL = continuous loop; FAB = fabric; M = multistrike; 0 = other.
20. Paper path: B = bottom; F = front; R = rear; T = top.
21. Keyboard layout: ANSI = American National Standards Institute; CALC = calculator; SEL = selectric; TTY = teletype; 0 = other.
23. Numeric cluster pad: If available, number of keys is given.
26. Character-repeat type: K = key; A = automatic and typematic.
27. Key rollover: If available, number is given.
38. Transmission modes: HD = half duplex; FD = full duplex.
39. Maximum communication speed is in Kbits per second.
41. Receive buffer size is in number of characters.
48. Built-in acoustic coupler or modem.
53. Horizontal tabbing: If available, number of stops is given.
54. Vertical tabbing: If available, number of stops is given.
56. Forms Access: If available, clearance is given in inches, unless otherwise indicated.

Manufacturer Model number Type	Anadex DP-9000B SIDM	Anadex DP-9001B SIDM	Anadex DP-9500B SIDM	Anadex DP-9501B SIDM	Anadex DP-9620B SIDM	Anadex DP-9625B SIDM	Anadex DP-9725B SIDM	Anadex DP-6500 SIDM
1. Print Method	IM	IM	IM	IM	IM	IM	IM	IM
2. Character Format	9x9	11x9	9x9	11x9	17x9	Nx18	Nx18	Nx18
3. Maximum Print Speed	240	250	240	250	240	240	240	540
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	96	96	96	96	96	96	96	96
6. Alternate Character Set	7	7	7	7	11	11	11	17
7. Number of Columns	106	133	176	220	216	216	216	216
8. Pitch, Character Spacing	10-13.3	10-16.7	10-13.3	10-16.7	10-16.4	10-16.4	10-16.4	10-16.4
9. Lines per Inch	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8
10. Paper Types	FF, M	FF, M	FF, M	FF, M	FF, M	FF, M	FF, M	CF, FF, M
11. Min.-Max. Paper Width	0-8	0-8	0-13.2	0-13.2	0-13.2	0-13.2	0-13.2	0-13.2
12. Max. No. of Copies + Original	4	4	4	4	4	4	4	4
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	TR	TR	TR	TR	TR	TR	TR	TR, FR
15. Line-Feed Time	55, 41.7	55, 41.7	55, 41.7	55, 41.7	55, 41.7	18.5, 13.8	18.5, 13.8	17.5, 13
16. Paper-Slew Rate	3	3	3	3	3	9	9	9.5
17. Color Printing	1	1	1	1	1	1	16	1
18. Ribbon Length	30,C	30,C	30,C	30,C	30,C	30,C	30,C	30,C
19. Ribbon Type	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB
20. Paper Path	R, B	R, B	R, B	R, B	R, B	R, B	R, B	R, B, T
21. Keyboard Layout	None	None	None	None	None	None	None	None
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	No	No	No	No	No	No	No	No
26. Character-Repeat Type	No	No	No	No	No	No	No	No
27. Key Rollover	No	No	No	No	No	No	No	No
28. Escape Key/Break Key	No	No	No	No	No	No	No	No
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Yes
36. Current Loop/RS 422	No	No	No	No	No	No	No	Yes
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	FD	FD	FD	FD	FD	FD	FD	FD
39. Max. Comm. Speed	9.6	9.6	9.6	9.6	9.6	9.6	9.6	19.2
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	3.5K 2K Opt.	3.5K 2K Opt.	3.5K 2K Opt.	3.5K 2K Opt.	3.5K 2K Opt.	3.5K 2K Opt.	3.5K 2K Opt.	4K 16K Opt.
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.
45. Autoview of Last Character	No	No	No	No	No	No	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	No	No	No	No	No	No	No
48. Acoustic Coupler or Modem	No	No	No	No	No	No	No	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	No	No	No	No	No	Yes	Yes	Yes
53. Horizontal Tabbing	16	16	16	16	16	16	16	16
54. Vertical Tabbing	16	16	16	16	16	16	16	16
55. Addressable Tabbing	No	No	No	No	Yes	Yes	Yes	Yes
56. Forms Access	No	No	No	No	No	No	No	No

Manufacturer Model number Type	Anadex WP6000 SIDM	Anderson Jacobson AJ 864 KSR	AT&T Teletype M40 DM	AT&T Teletype M43 DM	AT&T Teletype T300 L	Centronics 400 BL	Centronics 351 DM
1. Print Method	IM	IM	IM, B	IM	IM, DW	0	IM
2. Character Format	Nx18	5x9	7x9	7x9	FF	FF	7x9
3. Maximum Print Speed	284	180	400 lpm	47	300 lpm	500	200
4. Bidirectional/Logic Seeking	Yes	Yes	N/A	N/A	N/A	N/A	Yes
5. Printable Character Set	96	96	48, 64, 96	128	64, 94	256	96, 7
6. Alternate Character Set	14	2	No	No	2	Many	1
7. Number of Columns	220	132, 158	80, 132	80, 100, 132	132	136, 204	132
8. Pitch, Character Spacing	10-16.7	10-17.1	10	10-13	10	10-15	10-16.5
9. Lines per Inch	6, 8, 12, 16	6, PRO	3, 6, 4, 8	6	6, 8	6, 8, 12, PRO	6, 8
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF	CF, FF	CF, FF	FF, M	FF, M
11. Min.-Max. Paper Width	0-13.2	2-14.9	4-15	22	4-22	4-15	3-15
12. Max. No. of Copies + Original	4	6	6	4	6	6	6
13. Forms-Thickness Adjustment	Yes	Yes	No	No	Yes	N/A	Yes
14. Paper Drive	TR, FR	TR	FR, TR	P, TR, FR	TR	TR	TR
15. Line-Feed Time	17.5, 5.9	72	N/A	N/A	N/A	30	50
16. Paper-Slew Rate	9.5	3	N/A	N/A	12	15	8
17. Color Printing	1	No	No	No	No	No	No
18. Ribbon Length	30,C	27	N/A	C	33	80, C	70, C
19. Ribbon Type	CL, FAB	FAB	N/A	N/A	A	CL, M, FAB	CL, FAB
20. Paper Path	R, B, T	T	B	R	R	B	R
21. Keyboard Layout	None	SEL	N/A	TTY	N/A	N/A	N/A
22. Number of Keys	N/A	60	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	17	N/A	N/A	16	N/A	N/A
24. Local, Online Control	Yes	Yes	N/A	N/A	Yes	Yes	N/A
25. Shift Reverse, Alpha Lock	No	Yes	N/A	N/A	N/A	No	N/A
26. Character-Repeat Type	No	K	N/A	N/A	N/A	No	N/A
27. Key Rollover	No	N-Key	N/A	N-Key	Yes	No	N/A
28. Escape Key/Break Key	No	Yes	N/A	N/A	Yes	No	N/A
29. Top-of-Form Setting	Yes	Yes	N/A	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	N/A	Yes	Yes	Yes	No
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	N/A	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	N/A	N/A	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	N/A	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Yes	No	N/A	Yes	No	Yes	Opt.
37. Parallel Interface	Yes	No	N/A	N/A	Yes	Yes	Yes
38. Transmission Modes	FD	HD, FD	HD, FD	HD, FD	FD	HD, FD	FD
39. Max. Comm. Speed	19.2	9.6	2.4	2.4	9.6	19.2	19.2
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	4K, 16K Opt.	1.1K	3.9K	16K	N/A	4K	2K
42. Line Control (X-ON/X-OFF)	Yes	Yes	N/A	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	N/A	Yes	Yes	Yes	Yes
44. APL Character Set	No	Yes	N/A	No	No	No	No
45. Autoview of Last Character	No	Yes	N/A	Yes	Yes	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	Prog.	N/A	Yes	Yes	No	No
48. Acoustic Coupler or Modem	No	No	N/A	N/A	No	No	No
49. Full Graphics	Yes	Yes	No	No	No	No	Yes
50. Compressed Print	Yes	Yes	N/A	No	No	Yes	Yes
51. Expanded Print	Yes	Yes	N/A	No	No	No	Yes
52. Proportional Spacing	Yes	Yes	N/A	No	No	No	Yes
53. Horizontal Tabbing	16	132	132	Yes	Yes	Yes	16
54. Vertical Tabbing	16	128	72	Yes	Yes	Yes	16
55. Addressable Tabbing	Yes	Yes	No	No	No	Yes	No
56. Forms Access	No	No	4-9	No	Yes	1	No

Manufacturer Model number Type	Centronics 352 DM	Centronics 353 DM	Centronics 357 DM	Centronics 358 DM	CIE Terminals CI300 L	Computer Devices 2300 KSR, R/O, DM	Computer Devices 2100 KSR, R/O, DM
1. Print Method	IM	IM	IM	IM	IM	TM	TM
2. Character Format	7x8	7x9	7x8	7x9	.13mm	5x10	5x10
3. Maximum Print Speed	200	200	400	400	300 1pm	160	160
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	N/A	Yes	Yes
5. Printable Character Set	96, 7	96, 7	96, 7	96, 7	350	96	96
6. Alternate Character Set	1	1	1	2	0	2	2
7. Number of Columns	132	132	132	132	80-136	80, 132	80, 132
8. Pitch, Character Spacing	10-16.5	10-16.5	10-16.7	10-16.7	10-16.67	10.8, 6-18.4	10.8, 6-18.4
9. Lines per Inch	6, 8	3, 4, 6, 8, 12	6, 8, PRO	3, 4, 6, 8	3, 4, 6, 8	6	6
10. Paper Types	FF, M	FF, M	FF, M, CS	FF, M, CS	CF, M	CF, T	CF, T
11. Min.-Max. Paper Width	3-15	3-15	3-15	3-15	11-14.5	8 3/4	8 3/4
12. Max. No. of Copies + Original	6	6	6	6	6	1	1
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	N/A	N/A
14. Paper Drive	TR	TR	TR, FR	TR, FR	TR	FR	FR
15. Line-Feed Time	50	50	30	30	N/A	33.3	33.3
16. Paper-Slew Rate	8	8	8	8	15-30	5	5
17. Color Printing	No	No	No	7	No	No	No
18. Ribbon Length	70, C	70, C	70, C	70, C	60	N/A	N/A
19. Ribbon Type	CL, FAB	CL, FAB	CL, M, O	CL, M, O	FAB	N/A	N/A
20. Paper Path	R	R	R, T	R, T	R, B, F	T	T
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	0	No
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	96	N/A
23. Numeric Cluster Pad	N/A	No	N/A	N/A	N/A	No	No
24. Local, Online Control	N/A	No	Yes	Yes	Yes	Yes	N/A
25. Shift Reverse, Alpha Lock	N/A	No	HC	HC	N/A	No	N/A
26. Character-Repeat Type	N/A	No	HC	HC	N/A	No	N/A
27. Key Rollover	N/A	No	HC	HC	N/A	No	N/A
28. Escape Key/Break Key	N/A	No	HC	HC	No	Yes	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	No	No
30. Forms Align	No	No	Yes	Yes	Yes	No	No
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	No	No
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	No	No
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	No	No
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Opt.	Opt.	Opt.	Opt.	Yes	Opt.	Opt.
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Opt.	Opt.
38. Transmission Modes	FD	FD	FD	FD	FD	HD, FD	HD, FD
39. Max. Comm. Speed	19.2	19.2	19.2	19.2	19.2	9.6	9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	2K	4K	2K	4K	448, 452	2K, 4K Opt.	2K, 4K Opt.
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	No	No	No	No	No	Opt.	Opt.
45. Autoview of Last Character	No	No	No	No	No	Yes	Yes
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	No	Yes	Yes	Yes	Opt.	Opt.
48. Acoustic Coupler or Modem	No	No	No	No	No	Yes	Yes
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Opt.	Opt.
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	No	No	No	No	Yes	No	No
53. Horizontal Tabbing	No	Yes	No	218	80-136	4	4
54. Vertical Tabbing	Yes	Yes	16	192	Unltd.	No	No
55. Addressable Tabbing	No	No	No	Yes	Yes	No	No
56. Forms Access	No	No	3-15	3-15	No	N/A	N/A

Manufacturer Model number Type	Computer Transceiver MSP 100 M, SP, PR, R/O	Computer Transceiver MSP 200 M, SP, PR, R/O	Computer Transceiver 420 R/O	Computer Transceiver 430 TP/KSR	Computer Transceiver 440 KSR w/modem	Computer Transceiver 443 ME, K, M	Computer Transceiver 4000 KSR Desk-top
1. Print Method	TM	TM	IM	IM	IM	IM	TM
2. Character Format	16xN	16xN	7xN	7xN	7xN	7xN	5x7
3. Maximum Print Speed	200 +	200 +	80	80	80	80	40
4. Bidirectional/Logic Seeking	Yes	Bidirect.	No	No	No	No	No
5. Printable Character Set	User-def.	User-def.	128	128	128	128	128
6. Alternate Character Set	User-def.	User-def.	14	14	14	14	1
7. Number of Columns	132	233	140	140	140	140	136
8. Pitch, Character Spacing	5.25, 9.25, 10, 17	5.25, 9.25, 10, 17	5.25, 9.25, 10, 17	5.25, 9.25, 10, 17	2-12 lpi	2-12 lpi	10
9. Lines per Inch	PRO	6-24	4, 6, 8, PRO	PRO	PRO	PRO	6
10. Paper Types	T	CF, FF, T	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	T
11. Min.-Max. Paper Width	8 1/2	8 3/4, 14 7/8	8 1/2	8 1/2	8 1/2	8 1/2	8 3/4-14 7/8
12. Max. No. of Copies + Original	1	1	3	2	3	2	1
13. Forms-Thickness Adjustment	No	No	No	No	No	No	No
14. Paper Drive	FR	FR	FR	FR	FR	FR	FR
15. Line-Feed Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16. Paper-Slew Rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A
17. Color Printing	No	No	No	No	No	No	No
18. Ribbon Length	N/A	N/A	10M Char., C	10M Char., C	10M Char., C	10M Char., C	N/A
19. Ribbon Type	N/A	N/A	A	A	A	A	N/A
20. Paper Path	R, T	T	T	T	T	T	B
21. Keyboard Layout	N/A	N/A	N/A	SEL	SEL	SEL	SEL, TTY
22. Number of Keys	N/A	N/A	62	62	62	62	Varies
23. Numeric Cluster Pad	N/A	N/A	N/A	No	No	No	Yes
24. Local, Online Control	Yes	Yes	N/A	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	Yes	Yes	Yes	Yes
26. Character-Repeat Type	N/A	N/A	N/A	A	A	A	A
27. Key Rollover	N/A	N/A	N/A	2	2	2	N-Key
28. Escape Key/Break Key	N/A	N/A	N/A	Yes	Yes	Yes	Yes
29. Top-of-Form Setting	Yes	No	Opt.	Opt.	Opt.	Opt.	N/A
30. Forms Align	Yes	No	No	No	No	No	N/A
31. Form-Feed Setting	Yes	Yes	Opt.	Opt.	Opt.	Opt.	N/A
32. Forms-Length Setting	Yes	No	Yes	Opt.	Opt.	Opt.	N/A
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Yes	Opt.	Yes	Yes	Yes	Yes	Opt.
37. Parallel Interface	Yes	Opt.	No	No	No	No	No
38. Transmission Modes	HD, FD	HD, FD	HD, FD	HD, FD	HD, FD	HD, FD	HD, FD
39. Max. Comm. Speed	9.6	9.6	1.2	1.2	1.2	1.2	9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	8K	12K	2K	256	256	16K	Int.
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	Yes	Yes	No	No	No	No	Opt.
45. Autoview of Last Character	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	Yes	Yes	Yes	Yes	Yes	Yes	Yes
48. Acoustic Coupler or Modem	Yes	Yes	Opt.	Opt.	Yes	Yes	Yes
49. Full Graphics	Opt.	Opt.	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	No
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	No
52. Proportional Spacing	Opt.	Opt.	No	No	No	No	No
53. Horizontal Tabbing	132	132	No	No	No	No	Yes
54. Vertical Tabbing	No	No	N/A	N/A	No	N/A	Opt.
55. Addressable Tabbing	Yes	Yes	N/A	N/A	No	N/A	No
56. Forms Access	N/A	N/A	N/A	N/A	N/A	N/A	No

Manufacturer Model number	Computer Transceiver 4120 KSR	Dataproducts DP-35	Dataproducts DP-55	Dataproducts M-100	Dataproducts M-120	Dataproducts M-200	Dataproducts 8010
Type	Desk-top	DW	DW	DM	DM	DM	DM
1. Print Method	TM	DW	DW	IM	iM	IM	IM
2. Character Format	16xN	FF	FF	9x14	7x7	7x7	36x18
3. Maximum Print Speed	200 +	35	55	140	180	340	180
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	User-Def.	96	88, 92, 96	Prog.	128	128	Yes
6. Alternate Character Set	User-Def., Download	1	1	Unltd.	5	5	28
7. Number of Columns	233	132-196	132-196	132	132	132	80
8. Pitch, Character Spacing	5.25, 9.25, 10, 17	10-15	10-15	5-16.7	5-16.7	5-16.7	10-17.1
9. Lines per Inch	6-24, PRO	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8
10. Paper Types	T	CF, FF, M, CS	CF, FF, M, CS	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	8 3/4-14 7/8	2-15	2-15	3-16	3-16	3-16	3 1/2-9 1/2
12. Max. No. of Copies + Original	1	6	6	6	6	6	4
13. Forms-Thickness Adjustment	No	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	FR	TR, FR	TR, FR	TR	TR	TR	P, TR, FR
15. Line-Feed Time	N/A	55	37	50	50	50	N/A
16. Paper-Slew Rate	N/A	3	4.6	10	10	10	2
17. Color Printing	No	No	No	No	No	No	No
18. Ribbon Length	N/A	130, C	130, C	40, C	40, C	40, C	35
19. Ribbon Type	N/A	CL, M, FAB, O	CL, M, FAB, O	CL, M, FAB	CL, M, FAB	CL, M, FAB	CL, FAB
20. Paper Path	B	T, B	T, B	B, R, F	B, R, F	R, B, F	R, B, T, F
21. Keyboard Layout	SEL, TTY	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	Varies	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	Yes	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	N/A	N/A	N/A	N/A	N/A	Yes
25. Shift Reverse, Alpha Lock	Yes	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N-Key	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	Yes	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	N/A	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	N/A	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	N/A	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	N/A	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Opt.	Yes	Yes	Yes	Yes	Yes	Yes
37. Parallel Interface	Opt.	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	HD, FD	HD, FD	HD, FD	HD	HD	HD	HD
39. Max. Comm. Speed	9.6	9.6	9.6	9.6	9.6	9.6	19.5
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	4K	1K, 3K Opt.	1K, 3K Opt.	1K	1K	1K	8K
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	No	No	No	No	No	Yes
44. APL Character Set	Yes	Yes	Yes	No	No	No	Yes
45. Autoview of Last Character	Yes	Yes	Yes	Yes	Yes	Yes	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	Yes	No	No	Yes	Yes	Yes	No
48. Acoustic Coupler or Modem	Yes	No	No	No	No	No	No
49. Full Graphics	Opt.	Yes	Yes	Yes	No	No	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	Opt.	Yes	Yes	Yes	No	No	Yes
53. Horizontal Tabbing	Yes	1 1/120"	1 1/120"	128	No	No	Yes
54. Vertical Tabbing	233	1 1/48"	1 1/48"	Opt.	Opt.	Opt.	Yes
55. Addressable Tabbing	No	Yes	Yes	Yes	Yes	Yes	Yes
56. Forms Access	N/A	4	4	No	No	No	No

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Manufacturer Model number	Dataproducts 8060	Data South DS 180	Data South DS 220	Diablo Systems 620 API	Diablo Systems 630 API	Diablo Systems 630 API/ECS	Diablo Systems 630 ECS (for IBM PC)
Type	DM	IM	IM	DW	DW	DW	DW
1. Print Method	IM	IM	IM	DW	DW	DW	DW
2. Character Format	36x18	9x7	9x7, 15x18, 18x48	FF	FF	FF	FF
3. Maximum Print Speed	200	180	220	25	40	40	40
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	Yes	96	96	98	96	96	241
6. Alternate Character Set	28	1	1	13	12	12	12
7. Number of Columns	132	132	132	132-198	132-198	132-198	132-198
8. Pitch, Character Spacing	10-17.1	5-16.5	5-16.5	10-15	10-15	10-15	10-15
9. Lines per Inch	6, 8	6, 8, PRO	6, 8, PRO	6	6	6	6
10. Paper Types	CF, FF, M	FF, CF	FF, CF	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	3 1/2-17 1/2	3-15	3-15	15.2 Max.	16 Max.	16 Max.	16 Max.
12. Max. No. of Copies + Original	4	6	6	5	6	6	6
13. Forms-Thickness Adjustment	Yes	Yes	Yes	No	No	No	No
14. Paper Drive	P, TR, FR	TR	TR	FR	FR	FR	FR
15. Line-Feed Time	N/A	N/A	N/A	N/A	N/A	N/A	N/A
16. Paper-Slew Rate	2	5	5	N/A	N/A	N/A	N/A
17. Color Printing	8	No	No	No	No	No	No
18. Ribbon Length	35	15	15	450K IMP	360K IMP	360K IMP	360K IMP
19. Ribbon Type	CL, FAB	CL	CL	M	M	M	M
20. Paper Path	R, B, T, F	B, F	B, F	T	B, T	B, T	B, T
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	N/A	N/A	N/A	N/A
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	No	No	No	No
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Prog.	Prog.	Prog.	Prog.
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	No
36. Current Loop/RS 422	Yes	No	No	No	No	No	No
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	HD	HD, FD	HD, FD	N/A	N/A	N/A	N/A
39. Max. Comm. Speed	19.5	9.6	9.6	1.2	9.6	9.6	N/A
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	N/A
41. Receive Buffer Size	8K	2K	2K	1512	1344	1344	1344
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	No	Yes	Yes	Yes
44. APL Character Set	Yes	Opt.	Opt.	No	Yes	Yes	Yes
45. Autoview of Last Character	No	Yes	Yes	No	No	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	Opt.	Opt.	No	N/A	N/A	N/A
48. Acoustic Coupler or Modem	No	N/A	N/A	No	No	No	No
49. Full Graphics	Yes	Yes	Yes	N/A	N/A	N/A	N/A
50. Compressed Print	Yes	Yes	Yes	N/A	N/A	N/A	N/A
51. Expanded Print	Yes	Yes	Yes	N/A	N/A	N/A	N/A
52. Proportional Spacing	Yes	No	No	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	Yes	132	132	Prog.	Prog.	Prog.	Prog.
54. Vertical Tabbing	Yes	32	32	Prog.	Prog.	Prog.	Prog.
55. Addressable Tabbing	Yes	No	No	Yes	Yes	Yes	Yes
56. Forms Access	No	No	No	Yes	Yes	Yes	Yes

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Public and Private Data Networks

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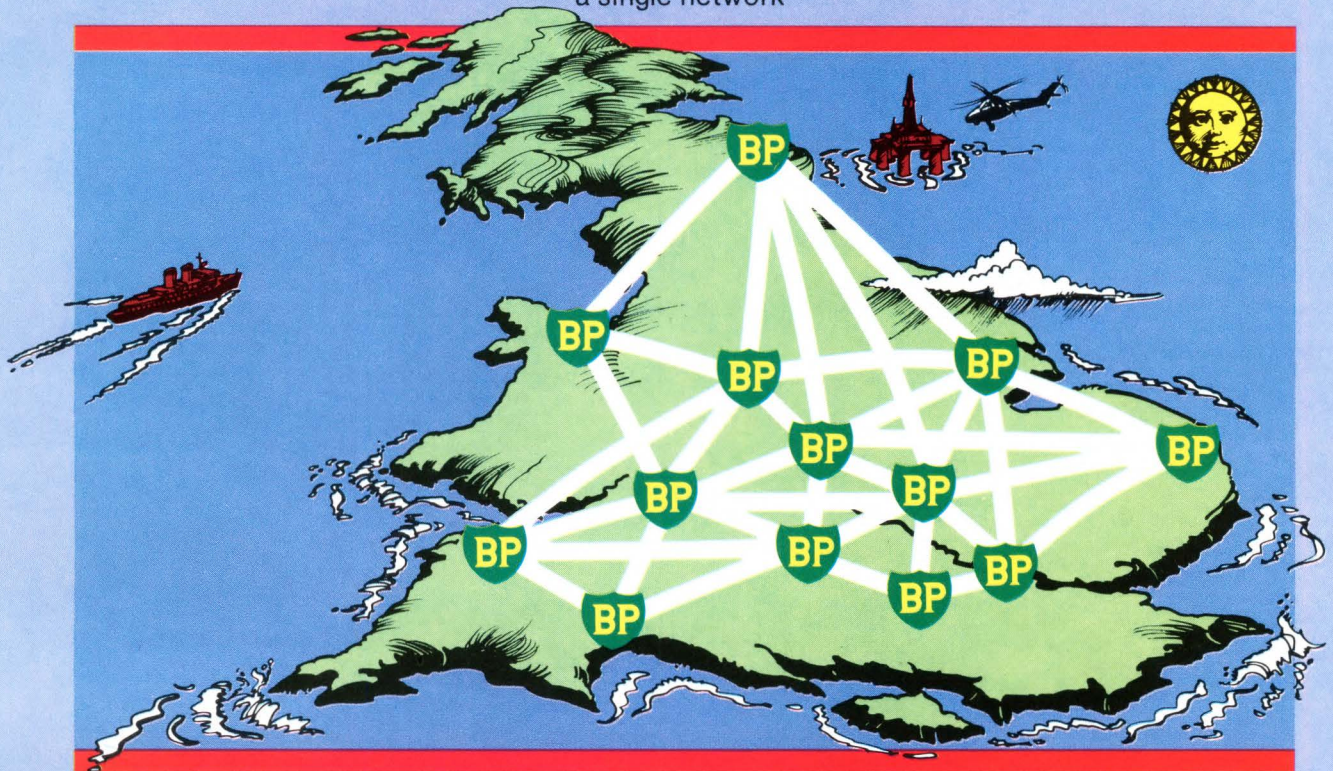
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Manufacturer Model number	Diablo Systems C150	Diablo Systems S11CQ/P11CQ	Diablo Systems P32CQ ECS Series	Diablo Systems P38/S38	Digital Equipment LN01 Laser	Digital Equipment LP27	Digital Equipment LP26
Type	CIJ	DM	DM	DM	PP	BL	BL
1. Print Method	0	IM	IM	IM	0	B	B
2. Character Format	12x16	9x7, 16x35	9x11, 16x36	7x7	FF	FF	FF
3. Maximum Print Speed	20	100	150	400	12 ppm	1200	600
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	N/A	LS	LS
5. Printable Character Set	192, 64	96	96	96	188	64	64
6. Alternate Character Set	N/A	7	7	7	60	11	14
7. Number of Columns	8½" PW	80	132	132	132	132	132
8. Pitch, Character Spacing	10	5-16.6	5-16.6	5-10	4-24	10	10
9. Lines per Inch	6	6, 8, PRO	6, 8	6, 8	18, 3, PRO	6, 8	6, 8
10. Paper Types	CF, SH	FF, M	FF, M	FF	CS	FF, M	FF, M
11. Min.-Max. Paper Width	10	3-10	3-15	3-15	8.3-8.5	3.5-15	3.5-15
12. Max. No. of Copies + Original	N/A	3	5	5	1	6	5
13. Forms-Thickness Adjustment	N/A	No	Yes	Yes	N/A	Yes	Yes
14. Paper Drive	FR	TR, FR	TR, FR	TR	FR	TR	TR
15. Line-Feed Time	120	95	100	50	N/A	14	25
16. Paper-Slew Rate	5	3	3	10	N/A	50	20
17. Color Printing	7	No	No	No	N/A	No	No
18. Ribbon Length	N/A	C	C	C	N/A	50	150, C
19. Ribbon Type	N/A	CL	CL	CL	N/A	A, FAB	CL, FAB
20. Paper Path	R, T	R, B, F	R, B, F	R, B	R, B	B	B
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	N/A	N/A	N/A	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	N/A	Yes	Yes	Yes	N/A	Yes	Yes
30. Forms Align	N/A	Yes	Yes	Yes	N/A	Yes	Yes
31. Form-Feed Setting	N/A	Yes	Yes	Yes	N/A	Yes	Yes
32. Forms-Length Setting	N/A	Yes	Yes	Yes	N/A	Yes	Yes
33. Character-Space Setting	N/A	Yes	Yes	Yes	N/A	No	Yes
34. Auto Line-Feed Setting	N/A	Yes	Yes	Yes	N/A	No	No
35. Serial ERA RS 232	Yes	Yes	No	Yes	No	No	No
36. Current Loop/RS 422	N/A	No	No	No	No	No	No
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	N/A	FD	FD	FD	N/A	N/A	N/A
39. Max. Comm. Speed	N/A	9.6	7.5	9.6	72	500	500
40. Selectable Parity	N/A	Yes	No	No	N/A	No	No
41. Receive Buffer Size	4K	2K	2K	1 line	N/A	1 line	1 line
42. Line Control (X-ON/X-OFF)	N/A	Yes	N/A	Yes	N/A	No	N/A
43. Audible Alarm	N/A	No	No	No	N/A	No	N/A
44. APL Character Set	N/A	No	No	No	N/A	No	No
45. Autoview of Last Character	N/A	Yes	Yes	Yes	N/A	No	N/A
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	N/A	No	No	No	N/A	No	No
48. Acoustic Coupler or Modem	N/A	No	No	No	N/A	No	N/A
49. Full Graphics	Yes	Yes	Yes	No	No	No	No
50. Compressed Print	Yes	Yes	Yes	No	SD	No	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	SD	No	No
52. Proportional Spacing	N/A	No	No	No	SD	No	No
53. Horizontal Tabbing	N/A	No	32	No	SD	No	No
54. Vertical Tabbing	N/A	No	16	No	SD	Some Models	Some Models
55. Addressable Tabbing	N/A	No	Yes	No	SD	Some Models	Some Models
56. Forms Access	N/A	2	3	3.5	No	No	No

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Manufacturer Model number	Digital Equipment LP25	Digital Equipment LA100	Digital Equipment LA120 DECWriter III	Digital Equipment LA12 DECWriter Corresp.	Digital Equipment LA50	Digital Equipment LQP02
Type	BL	LQDM	DM	LW	DTM	DT
1. Print Method	B	IM	IM	IM	IM	DW
2. Character Format	FF	7x9, 33x9, 33x18	7x9	9x9	7x9, 13x9	FF
3. Maximum Print Speed	300 lpm	240, 30	180	150	100	32 avg.
4. Bidirectional/Logic Seeking	LS	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	64	5 Sets of 96	2 Sets of 96	96	14 Sets of 96	96
6. Alternate Character Set	14	55	7	12	1	23
7. Number of Columns	132	217	217	132	132	210
8. Pitch, Character Spacing	10-15	5-16.5	5-16.5	5-16.5	5-16.5	10-15, Prog. 16-20
9. Lines per Inch	6, 8	2, 3, 4, 6, 8, 12	2, 3, 4, 6, 8, 12	2, 3, 4, 6, 8, 12	2, 3, 4, 6, 8, 12	2, 3, 4, 6, 8
10. Paper Types	FF, M	CR, FF, M Opt. CS	FF, M	CF, FF, M	FF, M	FF, M, CS
11. Min.-Max. Paper Width	3.5-15	3-14.9	3-14.9	3-9.5	4-9.5	15
12. Max. No. of Copies + Original	5	4	6, Opt. 9	0	N/A	N/A
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	TR	FR, TR	TR	P, F, Opt. TR	FR, TR	FR, Opt. TR
15. Line-Feed Time	30	38	33	50	100	N/A
16. Paper-Slew Rate	20	5	N/A	N/A	1.3	5
17. Color Printing	No	1	1	1	1	1
18. Ribbon Length	150, C	C	C	C	C	C
19. Ribbon Type	CL, FAB	CL, FAB	A, FAB	CL, FAB	CL, FAB	M, FAB
20. Paper Path	B	T, R, B	B	R, T	R, T	R, T
21. Keyboard Layout	N/A	SEL, CALC	SEL, CALC	SEL	N/A	N/A
22. Number of Keys	N/A	68	68	66	3	N/A
23. Numeric Cluster Pad	N/A	18	18	Std. Im., Opt. Ext.	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	Alpha Lock	Capslock	Capslock	N/A	N/A
26. Character-Repeat Type	N/A	A, Prog.	A	A	N/A	N/A
27. Key Rollover	N/A	N-Key	N-Key	N-key	N/A	N/A
28. Escape Key/Break Key	N/A	Yes	Yes	Yes	N/A	Yes
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	No	Yes	No	Yes	Yes
34. Auto Line-Feed Setting	No	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	No	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	No	Opt.	Opt.	Opt.	RS 423	Opt.
37. Parallel Interface	Yes	Opt.	Opt.	No	No	No
38. Transmission Modes	N/A	FD	FD, HD	FD, HD	FD	HD, FD
39. Max. Comm. Speed	500	9.6	9.6	9.6	4.8	9.6
40. Selectable Parity	No	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	1 line	400, Opt. 4096	1024, Opt. 4096	1024	2048	256
42. Line Control (X-ON/X-OFF)	N/A	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	N/A	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	No	Opt.	Opt.	Yes	No	Yes
45. Autoview of Last Character	N/A	Yes	Yes	Yes	Yes	Yes
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	Prog.	Yes	Yes	No	No
48. Acoustic Coupler or Modem	N/A	No	No	Opt.	No	No
49. Full Graphics	No	Yes	No	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	No	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	No	No	No	No	No	Yes
53. Horizontal Tabbing	No	217, Prog.	217	132	132	210
54. Vertical Tabbing	Some Models	168, Prog.	168	168	No	168
55. Addressable Tabbing	Some Models	Yes	Yes	Yes	No	Yes
56. Forms Access	No	1½	N/A	1	½	No

Manufacturer Model number Type	Facit 4510 SM	Facit 4512 SM NLQ	Facit 4560 DW	Facit 4565 DW	Facit 5000A T	Facit 5000C G	Facit 5000V GLBC	Facit 4528 TLBC
1. Print Method	IM	IM	DW	DW	IM	IM	IM	IM
2. Character Format	9x9	9xN	FF	FF	5x7	9x9	9x9	5x7
3. Maximum Print Speed	120	140	22	40	150	168	165, 285	140-285
4. Bidirectional/Logic Seeking	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	288	288	96	96	96	96	96	96
6. Alternate Character Set	288	288	16	N/A	7	7	7	7
7. Number of Columns	80	132	130	132	80, 136	80, 136	136	136
8. Pitch, Character Spacing	10-17	10-17	10-15	10-12	10-17.2	10-17.2	10-17.2	10-17
9. Lines per Inch	6, 8	6, 8, PRO	PRO	PRO	6	6, 8	6, 8	6, 8
10. Paper Types	CF, FF, M	FF, M	FF, M	FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	4-11	4-15	4-15	4-16	3-11.5, 3-15	3-11.5, 3-15	3-15	3-15
12. Max. No. of Copies + Original	4	4	6	3	6	6	6	5
13. Forms-Thickness Adjustment	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
14. Paper Drive	TR, FR	TR, FR	TR, FR	TR, FR	TR	TR	TR	TR
15. Line-Feed Time	N/A	N/A	N/A	40	33	33	33	33
16. Paper-Slew Rate	N/A	N/A	9	N/A	5	5	5	5
17. Color Printing	1	1	1	1	No	No	No	No
18. Ribbon Length	C	C	C	C	15, C	18, C	18, C	18, C
19. Ribbon Type	CL	CL, O	M, FAB, O	M, O	CL, FAB	CL, FAB	CL, FAB	CL, FAB
20. Paper Path	R, T	R, B, T	T	B, T	B, T	R, B	R, B	B, T
21. Keyboard Layout	None	None	None	None	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	No	No	No	No	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	Yes	N/A	N/A	N/A	N/A
25. Shift Reverse, Alpha Lock	No	No	No	No	N/A	N/A	N/A	N/A
26. Character-Repeat Type	No	No	No	No	N/A	N/A	N/A	N/A
27. Key Rollover	No	No	No	No	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	No	No	No	No	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Opt.	Opt.	Opt.	Opt.	Yes	No	No	No
37. Parallel Interface	Yes	Yes	N/A	N/A	Yes	Yes	Yes	Yes
38. Transmission Modes	FD	FD	FD	FD	FD	FD	FD	FD
39. Max. Comm. Speed	9.6	9.6	9.6	2.4	9.6	9.6	9.6	9.6
40. Selectable Parity	Opt.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	2K	2K	2K	2K	512	512	512	512
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Yes
44. APL Character Set	N/A	N/A	N/A	N/A	No	No	No	No
45. Autoview of Last Character	Yes	Yes	Yes	Yes	No	No	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	N/A	N/A	N/A	N/A	No	No	No	No
48. Acoustic Coupler or Modem	N/A	N/A	N/A	N/A	No	No	No	No
49. Full Graphics	Yes	Yes	N/A	N/A	No	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	N/A	N/A	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	N/A	N/A	Yes	Yes	Yes	Yes
52. Proportional Spacing	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
53. Horizontal Tabbing	1/Inch	32	8	Prog.	1/8 Char.	32	32	32
54. Vertical Tabbing	Prog.	Prog.	Yes	Prog.	16	32	32	32
55. Addressable Tabbing	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes
56. Forms Access	No	No	No	No	Yes	Yes	Yes	Yes

Manufacturer Model number Type	Facit 4542 GLBC	Facit 4544 GLBC	Genicom 3014 S	Genicom 3024 S	Genicom 3180 S	Genicom 3184 S
1. Print Method	IM	IM	IM	IM	IM	IM
2. Character Format	14x9	14x9	9x9, 9x18	9x9, 9x18	9x9	9x9, 9x18
3. Maximum Print Speed	535	225	160, 32	200, 40	180	180, 45
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	128	128	189	189	135	135
6. Alternate Character Set	11	11	4	4	2	4
7. Number of Columns	150	150	132	132	136	136
8. Pitch, Character Spacing	2.54-5.08mm	2.54-5.08mm	5-17	5-17	5-16.7	5-16.7
9. Lines per Inch	6, 8	6, 8	6, 8, N/144, PRO	6, 8, N/144, PRO	3, 4, 6, 8, 12, N/144, PRO	3, 4, 6, 8, 12, N/144, PRO
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	2-17.8	2-17.8	5.1-15.5	5.1-15.5	2.5-15.5	5.1-15.5
12. Max. No. of Copies + Original	6	6	4	4	6	6
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	TR	TR	TR, FR	TR, FR	TR	TR, FR
15. Line-Feed Time	36 lps/6 ips	36 lps/6ips	40	40	35	35
16. Paper-Slew Rate	6-40 lpi 8-35 lpi	6-40 lpi 8-35 lpi	7	7	10	10
17. Color Printing	2	8	1	1	1; Opt. 2, 4, 7	1; Opt. 2, 4, 7
18. Ribbon Length	C	C	24, C	24, C	35, C	35, C
19. Ribbon Type	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB
20. Paper Path	B, R	B, R	R	R	R	R
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	N/A	N/A	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	No	No	No	No	No	No
37. Parallel Interface	Yes	Yes	Yes	Yes	Opt.	Opt.
38. Transmission Modes	FD	FD	FD	FD	FD	FD
39. Max. Comm. Speed	19.2	19.2	9.6	9.6	9.6	9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	766-8K	766-8K	2K, 8K Opt.	2K, 8K Opt.	512, 6K Opt.	512, 6K Opt.
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	Yes	Yes	No	No	No	No
45. Autoview of Last Character	No	No	N/A	N/A	N/A	N/A
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	No	No	No	No	No
48. Acoustic Coupler or Modem	No	No	No	No	No	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	Yes	Yes	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	16	16	64	64	22	22
54. Vertical Tabbing	16	16	54	54	12	12
55. Addressable Tabbing	Yes	Yes	Yes	Yes	Yes	Yes
56. Forms Access	Yes	Yes	1.35	1.35	2.1	2.1

Manufacturer Model number Type	Genicom 3300 S	Genicom 3304 S	Genicom 3400 S	Genicom 3404 S	Genicom 2030 DM	Genicom 2120 HSDM
1. Print Method	IM	IM	IM	IM	IM	IM
2. Character Format	10x9, 9x18	10x9, 9x18	9x9	9x9, 9x18	7x9	7x9
3. Maximum Print Speed	300, 100	300, 100	400	400, 100	60	150
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	135	135	135	135	96	96
6. Alternate Character Set	2	4	2	4	1	1
7. Number of Columns	136	136	136	136	132	132
8. Pitch, Character Spacing	5-16.7	5-16.7	5-16.7	5-16.7	10-16.5	10-16.5
9. Lines per Inch	3, 4, 6, 8, 12, N/144, PRO	3, 4, 6, 8, 12, N/144, PRO	3, 4, 6, 8, 12, N/144, PRO	3, 4, 6, 8, 12, N/144, PRO	2, 3, 4, 6, 8, 12, PRO	2, 3, 4, 6, 8, 12, PRO
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	2.5-15.5	2.5-15.5	2.5-15.5	2.5-15.5	2.95-15.35	2.95-15.35
12. Max. No. of Copies + Original	6	6	6	6	6	6
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	TR	TR, FR	TR	TR, FR	FR, Opt. TR, P	FR, Opt. TR, P
15. Line-Feed Time	35	35	35	35	45	45
16. Paper-Slew Rate	10	10	15	15	5	5
17. Color Printing	1; Opt. 2, 4, 7	1; Opt. 2, 4, 7	1; Opt. 2, 4, 7	1; Opt. 2, 4, 7	1	1
18. Ribbon Length	35, C	35, C	35, C	35, C	24, C	24, C
19. Ribbon Type	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB	CL, FAB
20. Paper Path	R	R	R	R	B, T	B, T
21. Keyboard Layout	N/A	N/A	N/A	N/A	ANSI	ANSI
22. Number of Keys	N/A	N/A	N/A	N/A	64	64
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	Opt. 16	Opt. 16
24. Local, Online Control	Yes	Yes	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	Yes	Yes
26. Character-Repeat Type	N/A	N/A	N/A	N/A	K	K
27. Key Rollover	N/A	N/A	N/A	N/A	No	No
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	Yes	Yes
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	No	No	No	No	Opt.	Opt.
37. Parallel Interface	Opt.	Opt.	Opt.	Opt.	No	No
38. Transmission Modes	FD	FD	FD	FD	HD, FD	HD, FD
39. Max. Comm. Speed	9.6	9.6	9.6	9.6	4.8, 9.6	4.8, 9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	512, 6K Opt.	512, 6K Opt.	512, 6K Opt.	512, 6K Opt.	614	614
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	No	No	No	No	Opt.	Opt.
45. Autoview of Last Character	N/A	N/A	N/A	N/A	Yes	Yes
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	No	No	No	Yes	Yes
48. Acoustic Coupler or Modem	No	No	No	No	Opt.	Opt.
49. Full Graphics	Yes	Yes	Yes	Yes	No	Opt.
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	No	No
52. Proportional Spacing	Yes	Yes	Yes	Yes	No	No
53. Horizontal Tabbing	22	22	22	22	20	20
54. Vertical Tabbing	12	12	12	12	20	20
55. Addressable Tabbing	Yes	Yes	Yes	Yes	No	No
56. Forms Access	2.1	2.1	2.1	2.1	No	No

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Manufacturer Model number Type	Genicom 200 HSDM	Genicom 200 S	Genicom 310/340 L	Genicom 510 L	Lear Siegler 500 DM NLQ	Lear Siegler 510 DM NLQ	Lear Siegler 520 DM NLQ
1. Print Method	IM	IM	B	B	IM	IM	IM
2. Character Format	9x7, Opt. 9x9	9x7, Opt. 9x9	FF	FF	7x9, 14x9	7x9, 14x9 14x18	7x9, 14x9 14x18
3. Maximum Print Speed	200	200	425 lpm	425 lpm	180	180	180
4. Bidirectional/Logic Seeking	No	Yes	N/A	N/A	Yes	Yes	Yes
5. Printable Character Set	96	96	48, 64, 96	48, 64, 96	128	128	128
6. Alternate Character Set	1	1	N/A	N/A	8	8	8
7. Number of Columns	136	136	132	132	136	136	136
8. Pitch, Character Spacing	10-16.5	10-16.5	10	10	5-16.5	5-16.5	5-16.5
9. Lines per Inch	6, 8	6, 8	6, Opt. 8	6, 8, PRO	6, 8, PRO	6, 8, PRO	6, 8, PRO
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	FF, M	FF, M	FF, M
11. Min.-Max. Paper Width	2-16.5	2-16.5	3-15	3-15	3-16	3-16	3-16
12. Max. No. of Copies + Original	9	9	6	6	6	6	6
13. Forms-Thickness Adjustment	Yes	Yes	No	No	Yes	Yes	Yes
14. Paper Drive	TR	TR	TR	TR, Opt. FR	TR	TR, FR	TR
15. Line-Feed Time	31	31	33	33	30	30	30
16. Paper-Slew Rate	20	20	8.3	20	7½	7½	7½
17. Color Printing	1, Opt. 2	1	1	1	No	No	8
18. Ribbon Length	75, C	70, C	65, C	65, C	42, C	42, C	42, C
19. Ribbon Type	CL, FAB	CL, FAB	CL, FAB	CL, FAB, M	CL, M, FAB	CL, M, FAB	CL, M, FAB
20. Paper Path	R, B	R, B	R, B	R, B	R, B	R, B, F	R, B
21. Keyboard Layout	ANSI	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	63	N/A	N/A	N/A	28	28	28
23. Numeric Cluster Pad	Opt. 11	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	Yes	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	K	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	No	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	Yes	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Opt.	Opt.	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Opt.	Opt.	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Opt.	Opt.	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	No	No	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Yes	Opt.	Opt.	Yes	Yes	Yes
36. Current Loop/RS 422	Opt.	Current Loop	Opt.	Opt.	Opt.	Opt.	Opt.
37. Parallel Interface	No	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	HD, FD	FD	FD	FD	FD	FD	FD
39. Max. Comm. Speed	1.2	9.6	9.6	9.6	9.6	9.6	9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	1K	768, 2K Opt.	132, Opt. 4K	132, Opt. 4K	2.5K, 4.5K Opt.	2.5K, 4.5K Opt.	2.5K, 4.5K Opt.
42. Line Control (X-ON/X-OFF)	Opt.	Yes	Opt.	Opt.	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	Opt.	Opt.	Opt.	Opt.	No	No	No
45. Autoview of Last Character	Yes	N/A	N/A	N/A	N/A	No	No
46. Self-Test	No	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	Opt.	No	No	No	No	No	No
48. Acoustic Coupler or Modem	No	No	No	No	No	No	No
49. Full Graphics	No	No	No	No	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	No	No	Yes	Yes	Yes
51. Expanded Print	No	No	No	No	Yes	Yes	Yes
52. Proportional Spacing	No	No	No	No	Yes	Yes	Yes
53. Horizontal Tabbing	224	No	N/A	N/A	250	250	250
54. Vertical Tabbing	128	240	66	66	250	250	250
55. Addressable Tabbing	No	No	No	No	Yes	Yes	Yes
56. Forms Access	Opt., ½-1½	Opt., ½-1½	No	No	Opt. 3	Opt. 3	3

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Manufacturer Model number Type	Lear Siegler 530 DM NLQ	Mannesmann Tally MT 1800 DM	Mannesmann Tally Spirit DM	Mannesmann Tally MT 160L DM	Mannesmann Tally MT 160I DM	Mannesmann Tally MT 180L DM	Mannesmann Tally MT 180I DM
1. Print Method	IM	IM	IM	IM	IM	IM	IM
2. Character Format	7x9, 14x9 14x18	9x7, 18x40	9x8	9x7, 18x20	9x7	9x7, 18x20	9x7
3. Maximum Print Speed	180	200, 50	80	160, 40	160	160, 40	160
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	128	96	228	96	96	96	96
6. Alternate Character Set	8	7	1	6	6	6	6
7. Number of Columns	136	132	80	80	80	132	132
8. Pitch, Character Spacing	5-16.5	5-16.5	5-17.7	5-20	5-20	5-20	5-20
9. Lines per Inch	6, 8, PRO	6, 8, PRO	6, 8	6, 8	6, 8	6, 8	6, 8
10. Paper Types	FF, M	CF, FF	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	3-16	4-15.25	3-10	3-10	3-10	3-16	3-16
12. Max. No. of Copies + Original	6	6	4	4	4	4	4
13. Forms-Thickness Adjustment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14. Paper Drive	TR, FR	TR	TR, FR	TR, FR	TR, FR	TR, FR	TR, FR
15. Line-Feed Time	30	50	N/A	170	170	70	70
16. Paper-Slew Rate	7 1/2	8	N/A	1.5	1.5	5	5
17. Color Printing	8	No	No	No	N/A	No	No
18. Ribbon Length	42, C	C	C	C	C	C	C
19. Ribbon Type	CL, M, FAB	CL, FAB, M	CL, M	CL, FAB, M	CL, FAB, M	CL, FAB, M	CL, FAB, M
20. Paper Path	R, B, F	R, T	R, T	R, T	R, T	R, T	R, T
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	28	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Prog.	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Prog.	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Yes	Opt.	Opt.	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Opt.	No	No	No	No	No	No
37. Parallel Interface	Yes	Opt.	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	FD	N/A	N/A	N/A	N/A	N/A	N/A
39. Max. Comm. Speed	9.6	N/A	N/A	N/A	N/A	N/A	N/A
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	2.5K, 4.5K Opt.	2K	1 Line w/RS232C	2K	2K	2K	2K
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	Yes	Yes	Yes	No	No	No	No
44. APL Character Set	No	No	No	No	No	No	N/A
45. Autoview of Last Character	No	N/A	N/A	N/A	N/A	N/A	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	N/A	No	N/A	N/A	No	No
48. Acoustic Coupler or Modem	No	N/A	No	N/A	N/A	N/A	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	Yes	No	No	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	250	16	N/A	16	16	16	16
54. Vertical Tabbing	250	16	N/A	16	16	16	16
55. Addressable Tabbing	Yes	Yes	N/A	N/A	N/A	No	No
56. Forms Access	3	Opt. 1.5	1	2	2	2	2

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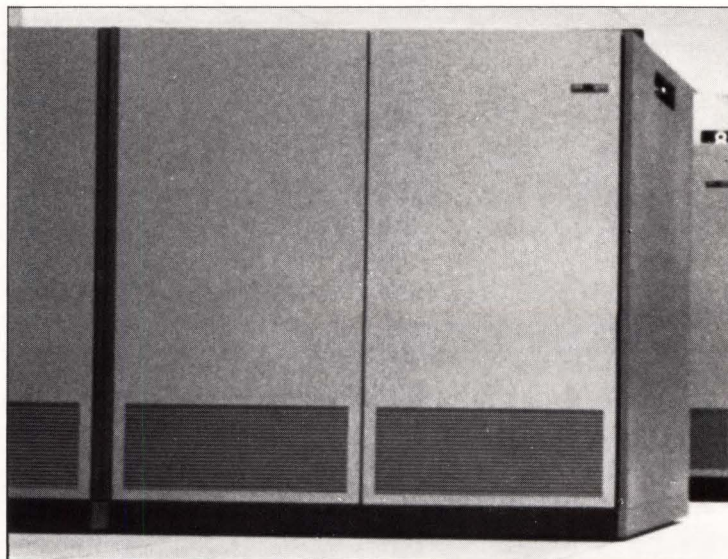
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Manufacturer Model number Type	Mannesmann Tally MT 440I/L HS DM	MPI Printmate 99 DM	MPI Printmate 150 DM	MPI Sprinter DM	NEC Home Electronics PC 8023 DM	NEC Home Electronics PC 8025 DM	NEC Home Electronics 15LQ DW
1. Print Method	IM	IM	IM	IM	IM	IM	DW
2. Character Format	9x7, 18x40	7x9, 9x11	7x9, 9x11	7x9, 9x11	7x9	7x9	FF
3. Maximum Print Speed	400, 100	100	150	160	120	120	14
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	96	96	96	96	96	96	96
6. Alternate Character Set	8	3	3	3	0	80	0
7. Number of Columns	132	80	136	80	80	120	80
8. Pitch, Character Spacing	5-16.5	10-17	10-17	10-17	6-17	6-17	10-15
9. Lines per Inch	6, 8, 12	6, 8	6, 8	8	6, 8	6, 8	6, 8
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	4-16	1-9.5	3-15	1-9.5	4.5-10	4.5-15	4.5-10
12. Max. No. of Copies + Original	5	4	4	4	4	4	4
13. Forms-Thickness Adjustment	Yes	No	No	No	No	No	No
14. Paper Drive	TR, FR	TR, FR	TR	TR, FR	P, FR	P, FR	TR, FR
15. Line-Feed Time	20	N/A	N/A	N/A	N/A	N/A	N/A
16. Paper-Slew Rate	16	1.7	3.3	2.5	N/A	N/A	N/A
17. Color Printing	Opt.	No	No	No	No	No	No
18. Ribbon Length	C	20, C	50, C	20, C	C	C	C
19. Ribbon Type	CL, FAB, M	CL	CL	CL	CL	CL	M, FAB, O
20. Paper Path	R, B, T	R, B, F	R, B, F	R, B, F	R	R	R
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	Yes	N/A	N/A	N/A	Yes	Yes	Yes
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	No	No	No	No	No	Yes
31. Form-Feed Setting	Yes	No	No	No	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	No	No	No
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	Opt.	Yes	Opt.	Opt.	No	No	No
36. Current Loop/RS 422	No	Opt.	Opt.	Opt.	No	No	No
37. Parallel Interface	Opt.	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	N/A	FD	FD	FD	No	No	No
39. Max. Comm. Speed	N/A	19.2	19.2	19.2	No	No	No
40. Selectable Parity	Yes	Yes	Yes	Yes	No	No	No
41. Receive Buffer Size	2K	2048	65,536	65,536	2K	3K	None
42. Line Control (X-ON/X-OFF)	Yes	Opt.	Opt.	Opt.	No	No	No
43. Audible Alarm	Yes	No	Yes	Yes	No	No	No
44. APL Character Set	N/A	No	No	No	No	No	No
45. Autoview of Last Character	N/A	No	No	No	No	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	N/A	Yes	Yes	Yes	No	No	No
48. Acoustic Coupler or Modem	N/A	Yes	Yes	Yes	No	No	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes	No
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	No	Yes	Yes	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	Yes	80	136	80	Yes	Yes	Yes
54. Vertical Tabbing	Yes	No	Prog.	Prog.	Yes	Yes	Yes
55. Addressable Tabbing	No	Yes	Yes	Yes	No	No	No
56. Forms Access	Opt. 1	No	No	No	SW	SW	SW

Manufacturer Model number Type	Okidata ML80 DM	Okidata ML82A DM	Okidata ML83A DM	Okidata ML92 DM	Okidata ML93 DM	Okidata ML84 Step 2 DM	Okidata Pacemark 2350 DM
1. Print Method	IM	IM	IM	IM	IM	IM	IM
2. Character Format	9x7	9x9	9x9	9x9	9x9	9x9	9x9
3. Maximum Print Speed	80	120	120	160	160	200	350
4. Bidirectional/Logic Seeking	No	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	96	96	96	96	96	96	96
6. Alternate Character Set	0	2	2	3	3	4	3
7. Number of Columns	80	80	136	80	136	136	136
8. Pitch, Character Spacing	5-16.5	5-16.5	5-16.5	5-17.1	5-17.1	5-17.1	5-17.1
9. Lines per Inch	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8	6, 8
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M
11. Min.-Max. Paper Width	9.5 Max.	2-9	16 Max.	9.5 Max.	16 Max.	16 Max.	16 Max.
12. Max. No. of Copies + Original	4	4	4	4	4	4	6
13. Forms-Thickness Adjustment	No	No	No	No	No	Yes	Yes
14. Paper Drive	P, FR, Opt. TR	P, FR, Opt. TR	FR, TR	P, FR, Opt. TR	FR, TR	FR, TR	TR
15. Line-Feed Time	112-150	95-115	95-115	103-124	103-124	50-50	40-50
16. Paper-Slew Rate	N/A	N/A	N/A	N/A	N/A	40	N/A
17. Color Printing	1	No	No	No	No	No	2
18. Ribbon Length	N/A	N/A	N/A	N/A	N/A	N/A	C
19. Ribbon Type	A, M	A, M	A, M	A, M	0	0	0
20. Paper Path	R	R, B	R, B	R, B	R, B	R, B	R, B
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	N/A
24. Local, Online Control	N/A	N/A	N/A	N/A	N/A	N/A	N/A
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	N/A
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	No	No	No	Yes	Yes	Yes
34. Auto Line-Feed Setting	No	Yes	Yes	Yes	Yes	Yes	Yes
35. Serial ERA RS 232	No	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	No	Yes	Yes	Yes	Yes	Yes	Yes
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
39. Max. Comm. Speed	N/A	19.2	19.2	19.2	19.2	19.2	19.2
40. Selectable Parity	No	No	No	No	N/A	N/A	N/A
41. Receive Buffer Size	N/A	2K Opt.	2K	2K	2K	2K	2K
42. Line Control (X-ON/X-OFF)	N/A	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	N/A	N/A	N/A	N/A	No	No	No
44. APL Character Set	N/A	N/A	N/A	N/A	Yes	Yes	Yes
45. Autoview of Last Character	N/A	N/A	N/A	Yes	No	No	No
46. Self-Test	N/A	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	N/A	N/A	N/A	Yes	N/A	N/A	N/A
48. Acoustic Coupler or Modem	No	No	No	No	No	No	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52. Proportional Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	No	No	No	Yes	Yes	Yes	Yes
54. Vertical Tabbing	No	Yes	Yes	Yes	Yes	Yes	Yes
55. Addressable Tabbing	No	Yes	Yes	Yes	Yes	Yes	Yes
56. Forms Access	No	No	No	No	No	No	No

Manufacturer Model number Type	Okidata Pacemark 2410 DM	Qume LetterPro 20 DW	Qume 11/40 Plus DW	Qume 11/55 Plus DW	Qume 11/130 Plus DW	Qume Plus Widetrack DW	Siemens PT 88 DM
1. Print Method	IM	DW	DW	DW	DW	DW	0
2. Character Format	9x9	FF	FF	FF	FF	FF	9x9
3. Maximum Print Speed	350	2	40	55	40	40	150
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	96	96	96	96	130	96	96
6. Alternate Character Set	3	100 +	100 +	100 +	20	100 +	7
7. Number of Columns	136	110	132	132	132	136	80
8. Pitch, Character Spacing	5-17.1	10-15	10-15	10-15	10-15	10-15	6-16
9. Lines per Inch	6, 8	6, 8, PRO	6, 8, PRO	6, 8, PRO	6, 8, PRO	6, 8, PRO	6, 8, PRO
10. Paper Types	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF, M	CF, FF
11. Min.-Max. Paper Width	16 Max.	2-13	2-15 1/2	2-15 1/2	2-15 1/2	2-22	4 1/2-9 7/8
12. Max. No. of Copies + Original	6	5	6	6	6	6	1
13. Forms-Thickness Adjustment	Yes	No	Yes	Yes	Yes	Yes	No
14. Paper Drive	FR, TR	TR, FR	TR, FR	TR, FR	TR, FR	FR, TR	TR, FR
15. Line-Feed Time	40-50	31	36	21	36	21	130
16. Paper-Slew Rate	N/A	3	2	3.5	2	3.5	2
17. Color Printing	2	1	1	1	1	1	No
18. Ribbon Length	C	C	C	C	C	C	N/A
19. Ribbon Type	0	M, FAB	M, FAB	M, FAB	M, FAB	M, FAB	N/A
20. Paper Path	R	T	T	T	T	T	R
21. Keyboard Layout	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22. Number of Keys	N/A	N/A	N/A	N/A	N/A	N/A	N/A
23. Numeric Cluster Pad	N/A	N/A	N/A	N/A	N/A	N/A	No
24. Local, Online Control	N/A	N/A	N/A	N/A	N/A	N/A	No
25. Shift Reverse, Alpha Lock	N/A	N/A	N/A	N/A	N/A	N/A	No
26. Character-Repeat Type	N/A	N/A	N/A	N/A	N/A	N/A	No
27. Key Rollover	N/A	N/A	N/A	N/A	N/A	N/A	No
28. Escape Key/Break Key	N/A	N/A	N/A	N/A	N/A	N/A	No
29. Top-of-Form Setting	N/A	Yes	Yes	Yes	Yes	Yes	Yes
30. Forms Align	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31. Form-Feed Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32. Forms-Length Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33. Character-Space Setting	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34. Auto Line-Feed Setting	Yes	N/A	N/A	N/A	N/A	N/A	Yes
35. Serial ERA RS 232	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36. Current Loop/RS 422	Yes	No	No	No	No	No	No
37. Parallel Interface	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38. Transmission Modes	N/A	HD, FD	HD, FD	HD, FD	HD, FD	HD, FD	HD
39. Max. Comm. Speed	19.2	9.6	9.6	9.6	9.6	9.6	9.6
40. Selectable Parity	N/A	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	2K	500	500	500	500	500	165, 4K Opt.
42. Line Control (X-ON/X-OFF)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43. Audible Alarm	No	Yes	Yes	Yes	Yes	Yes	Yes
44. APL Character Set	Yes	No	No	No	No	No	No
45. Autoview of Last Character	No	No	No	No	No	No	Yes
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	N/A	N/A	N/A	N/A	N/A	N/A	No
48. Acoustic Coupler or Modem	No	No	No	No	No	No	No
49. Full Graphics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50. Compressed Print	Yes	No	No	No	No	No	Yes
51. Expanded Print	Yes	No	No	No	No	No	Yes
52. Proportional Spacing	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53. Horizontal Tabbing	Yes	Yes	1800	Yes	Yes	1800	8
54. Vertical Tabbing	Yes	Yes	528	Yes	Yes	528	Prog.
55. Addressable Tabbing	Yes	N/A	N/A	N/A	N/A	N/A	Yes
56. Forms Access	No	N/A	N/A	N/A	N/A	N/A	N/A

Manufacturer Model number Type	Siemens PT 89 DM	Siemens M 203 IJ	Texas Instruments 703 KSR	Texas Instruments 707 KSR	Texas Instruments 810 DM	Texas Instruments 850 DM	Texas Instruments 855 DM
1. Print Method	0	0	TM	TM	IM	IM	IM
2. Character Format	9x9	14x12	5x7	5x7	9x7, Opt. 23x28	9x9, 15x9	9x9, 32x18
3. Maximum Print Speed	150	250	45	45	220	150	150
4. Bidirectional/Logic Seeking	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5. Printable Character Set	96	96	128	128	96	96, Opt. 128	96, Opt. 128
6. Alternate Character Set	7	7	8	8	10	7	14
7. Number of Columns	132	132	80, 132	80, 132	132, 218	80, 134	80, 134
8. Pitch, Character Spacing	6-16	6-16	10-17	10-17	5-16.5	5-16.7	10-16.7
9. Lines per Inch	6, 8, PRO	6, 8, PRO	6	6	6, 8, PRO	3, 4, 6, 8, PRO	3, 4, 6, 8, PRO
10. Paper Types	CF, FF	FF	T	T	CF, M, FF	CF, M, FF	CF, M, FF
11. Min.-Max. Paper Width	4 1/2-15 3/4	8 1/2-15 3/4	8 1/2	8 1/2	3-15	3-11	3-11
12. Max. No. of Copies + Original	1	1	1	1	9	3	3
13. Forms-Thickness Adjustment	No	No	No	No	Yes	Yes	Yes
14. Paper Drive	TR, FR	TR	FR	FR	TR	FR, TR	FR, TR
15. Line-Feed Time	130	30-40	33	33	33	33	33
16. Paper-Slew Rate	2	10	N/A	N/A	6.67	4 1/2-15	4 1/2-15
17. Color Printing	No	No	No	No	No	No	No
18. Ribbon Length	N/A	N/A	N/A	N/A	40	C	C
19. Ribbon Type	N/A	N/A	N/A	N/A	A, CL, M, FAB	CL, M, FAB	CL, M, FAB
20. Paper Path	R	R	R	R	R, B	T	T
21. Keyboard Layout	None	None	TTY	TTY	None	None	None
22. Number of Keys	0	0	51	51	N/A	N/A	N/A
23. Numeric Cluster Pad	No	No	No	No	N/A	N/A	N/A
24. Local, Online Control	No	No	Yes	Yes	N/A	N/A	N/A
25. Shift Reverse, Alpha Lock	No	No	Yes	Yes	N/A	N/A	N/A
26. Character-Repeat Type	No	No	A	A	N/A	N/A	N/A
27. Key Rollover	No	No	2	2	N/A	N/A	N/A
28. Escape Key/Break Key	No	No	Yes	Yes	N/A	N/A	N/A
29. Top-of-Form Setting	Yes	Yes	No	No	Prog.	Prog.	Prog.
30. Forms Align	Yes	Yes	No	No	Prog.	Prog.	Prog.
31. Form-Feed Setting	Yes	Yes	No	No	Prog.	Prog.	Prog.
32. Forms-Length Setting	Yes	Yes	No	No	Prog.	Prog.	Prog.
33. Character-Space Setting	Yes	Yes	No	No	Prog.	Prog.	Prog.
34. Auto Line-Feed Setting	Yes	Yes	Yes	Yes	Prog.	Prog.	Prog.
35. Serial ERA RS 232	Yes	Yes	Yes	No	Yes	Yes	Yes
36. Current Loop/RS 422	No	Yes	No	No	Opt.	Opt.	Opt.
37. Parallel Interface	Yes	Yes	No	No	Opt.	Yes	Yes
38. Transmission Modes	HD	HD	FD	FD	FD	FD	FD
39. Max. Comm. Speed	9.6	9.6	300	300	9.6	9.6	9.6
40. Selectable Parity	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41. Receive Buffer Size	165, 4K Opt.	2K	2K	2K	3K	256, 4K Opt.	256, 4K Opt.
42. Line Control (X-ON/X-OFF)	Yes	Yes	No	No	Yes	Opt.	Yes
43. Audible Alarm	Yes	Yes	Yes	Yes	No	No	No
44. APL Character Set	No	No	No	No	No	No	No
45. Autoview of Last Character	Yes	Yes	Yes	Yes	No	No	No
46. Self-Test	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47. Answerback	No	No	Yes	Yes	No	No	No
48. Acoustic Coupler or Modem	No	No	No	Yes	No	No	No
49. Full Graphics	Yes	Yes	No	No	Yes	Yes	Yes
50. Compressed Print	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51. Expanded Print	Yes	Yes	No	No	No	Yes	Yes
52. Proportional Spacing	Yes	Yes	No	No	Yes	No	Yes
53. Horizontal Tabbing	8	8	No	No	Prog.	Prog.	Prog.
54. Vertical Tabbing	Prog.	Prog.	No	No	Prog.	Prog.	Prog.
55. Addressable Tabbing	Yes	Yes	No	No	Prog.	Prog.	Prog.
56. Forms Access	N/A	N/A	No	No	No	No	No

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Key

Printer types

BL = band line; CIJ = color ink jet;
DM = dot matrix; DT = desk-top;
DTM = desk-top multimode;
DW = daisywheel; G = graphics;
GLBC = graphics label bar code;
HS = high speed; IJ = ink jet;
IM = impact matrix; K = key-
board; KSR = keyboard send
receive; L = line; LQ = letter
quality; LQDM = letter quality dot
matrix; LW = lightweight; M =
modem; ME = memory; NLQ =
near letter quality; PP = page
printer; PR = printer; RO = receive
only; S = serial; SM = serial
matrix; SIDM = serial impact dot
matrix; T = text; SP = spooler;
TLBC = text label bar code.

General abbreviations

Char. = characters; cpi = charac-
ters per inch; cpm = characters
per minute; HC = host controlled;
IMP = impressions; Int. = internal;
ips = inches per second; lpi = lines
per inch; lpm = lines per minute;
lps = lines per second; mm = milli-
meters; ppm = pages per minute;
PW = printable width; SD = soft-
ware dependent; SW = software
controlled.

Individual specifications for units of measurement

1. Print method: B = belt; DW = daisywheel; IM = impact matrix; TM = thermal matrix; O = other.
2. Character format: Indicates dot-matrix density or if full font (FF).
3. Maximum print speed is in characters per second, unless otherwise indicated.
5. Printable character sets: number of characters.
6. Alternate character sets: number of sets.
7. Number of columns or inches of printable width.
8. Character spacing is in characters per inch, unless otherwise specified.
9. Lines per inch: All choices are included, PRO = program-mable.

10. Paper types: CF = contin-
uous feed; CS = cutsheet;
FF = fanfold; M = multipart;
SH = sheet; SS = single
sheet; T = thermal.
11. Minimum-Maximum paper
width is in inches, unless
otherwise indicated.
14. Paper drive: FR = Friction;
P = Pin; TR = Tractor.
15. Line-feed time is in milli-
seconds, unless otherwise
indicated.
16. Paper-slew rate is in
inches per second, unless
otherwise indicated.
17. Color printing: If available,
number of colors is given.
18. Ribbon length is in yards,
unless otherwise indicated;
C = cartridge.
19. Ribbon characteristics: A
= autoreversing; CL = con-
tinuous loop; FAB = fabric; M
= multistrike; O = other.
20. Paper path: B = bottom;
F = front; R = rear; T = top.
21. Keyboard layout: ANSI =
American National Stan-
dards Institute; CALC = cal-
culator; SEL = selectric; TTY
= teletype; O = other.
23. Numeric cluster pad: If
available, number of keys is
given.
26. Character-repeat type:
K = key; A = automatic and
typematic.
27. Key rollover: If available,
number is given.
38. Transmission modes: HD
= half duplex; FD = full du-
plex.
39. Maximum communication
speed is in Kbits per second.
41. Receive buffer size is in
number of characters.
48. Built-in acoustic coupler or
modem.
53. Horizontal tabbing: If
available, number of stops is
given.
54. Vertical tabbing: If available,
number of stops is given.
56. Forms Access: If available,
clearance is given in
inches, unless otherwise
indicated.



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Peripherals

(Continued from page 166)

smaller size allows more room for shock-mounting.

Hard disks are also notoriously difficult to back up. Users of low-powered hard disks use floppies to back up files. Users can use 1-M floppies to back up a 5-M hard disk without requiring an intolerable number of media changes. This is especially true if users only copy files that have been changed since they were last backed up. The latest version of the MS-DOS operating system allows such selective backup.

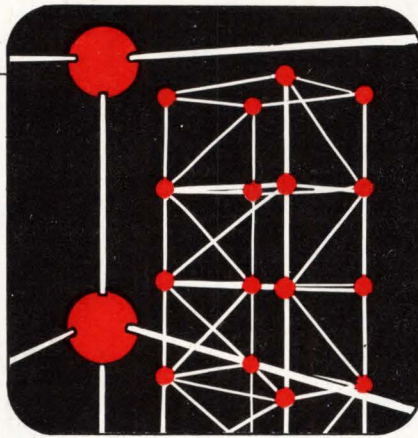
On larger disk systems, floppies become unwieldy. "Backing up an entire hard disk takes 30 diskettes, which can easily be damaged," points out Paul Trotter, who is responsible for evaluating new hardware and software for users at New York's Chemical Bank. The most common forms of high-capacity backup are tape drives and removable cartridge hard-disk drives.

Most tape drives for personal computers use cartridges and come in two varieties. Streaming-tape drives copy data unselectively; nonstreaming drives allow file-by-file backup. Cartridges often fit into the space for a disk drive on a personal computer.

Some nonstreaming cartridges offer extremely sophisticated capabilities. Advanced Digital Information's nonstreaming Data Library backup tape will not only back up files, but, acting as a very slow disk, it will keep the computer system operating if the hard disk fails. It costs about \$3,900 when installed on an IBM Personal Computer.

For a higher price, backup units are available that use the nine-track $\frac{1}{2}$ -inch tape traditionally used on minis and mainframes. These units are reliable. They allow data to be carried between different sizes of computers, but their high price has confined their use to installations with both large and small computers.

"We're considering $\frac{1}{2}$ -inch tape because we want to move data around between our personal computers and our IBM mainframes faster than the 1,200 bits per second a phone line allows," says Bekin's Murr. He says



his company is backing up its LANs with Data Library tape units. For small stand-alone installations, the company uses units with fixed and removable hard disks from Tallgrass.

Removable-cartridge hard disks can be removed from their drives like floppies. Like hard disks, they contain a variety of storage capacities. Most combine a fixed and a removable disk of equal capacities. Some of them dispense with the fixed hard disk altogether, and use the removable disk as the main storage medium. The cartridges are expensive—ranging from \$80 to \$130 each—but they provide fast, easy backup as well as a way to interchange large files. They also expand the storage capacity of hard-disk drives, and that makes them very cost-effective.

Trotter says another advantage of removable-cartridge drives is that they secure important data and programs. Cartridges containing sensitive information can be removed from the computer and locked away like floppy disks. Trotter uses cartridge drives from Tallgrass and Genie.

Scott Taylor, corporate planning systems analyst for Standard and Poor's Compustat Services division uses the removable-cartridge drives to provide users with large files of financial information on publicly traded companies. "Our database takes up about 10 Mbytes," he explains. "We strip off the data for the customer onto mag tapes and spin off one tape onto a Genie 20-Mbyte drive. We have four configurations like that."

Removable-cartridge drives can sate the demand for mass storage on personal computers. Unlike large computer systems, personal comput-

ers with hard disks are rarely called upon to do jobs that use most of their storage capacity at once. A personal computer may have 10 or 20 Mbytes of storage, but it will seldom need more than 2 or 3 Mbytes for any job. Removable-cartridge drives let users swap multi-megabytes of memory in and out of the computer system.

However, it pays to be careful when considering removable-cartridge hard disks as a data-transfer medium. They are not all interchangeable. Some are intended only as backup units and can only be read by the drive that recorded them.

Lee Eagan, marketing manager for Oliver H. Van Horn Co., a New Orleans-based hardware wholesaler, says his company went to an Iomega removable-cartridge system because it was searching for a super-floppy. "We gave each user two cartridges—one for a work file and one for backup," he says. The cartridges hold about 10 Mbytes each and cost about \$80 apiece.

Although it looks and acts like a removable cartridge hard-disk drive, the system Van Horn uses is not hard-disk. It is a non-rigid hard-disk system—a fairly new, hardier, storage device. Most of these devices look like cartridge hard-disk drives, but the media inside the cartridge are not rigid, and the unit is much less susceptible to head crashes.

3M's SSR is an example of this kind of system. Another example is the Bernoulli Box from Iomega. The Iomega cartridge contains a rapidly spinning flexible disk that is held close to the head by aerodynamics. As on a hard disk, the head flies over the surface as it spins, but since both the head and the medium are flexible, the cushion of air between them tends to hold them apart. You can't make a head crash on it," says Ed Sund, the senior technical-support specialist for Weyerhaeuser Corp., Federal Way, WA. Sund says one of his favorite demonstrations is to throw an Iomega cartridge across a room to prove there are no problems. "I do it about once a week to make a point," he says. □

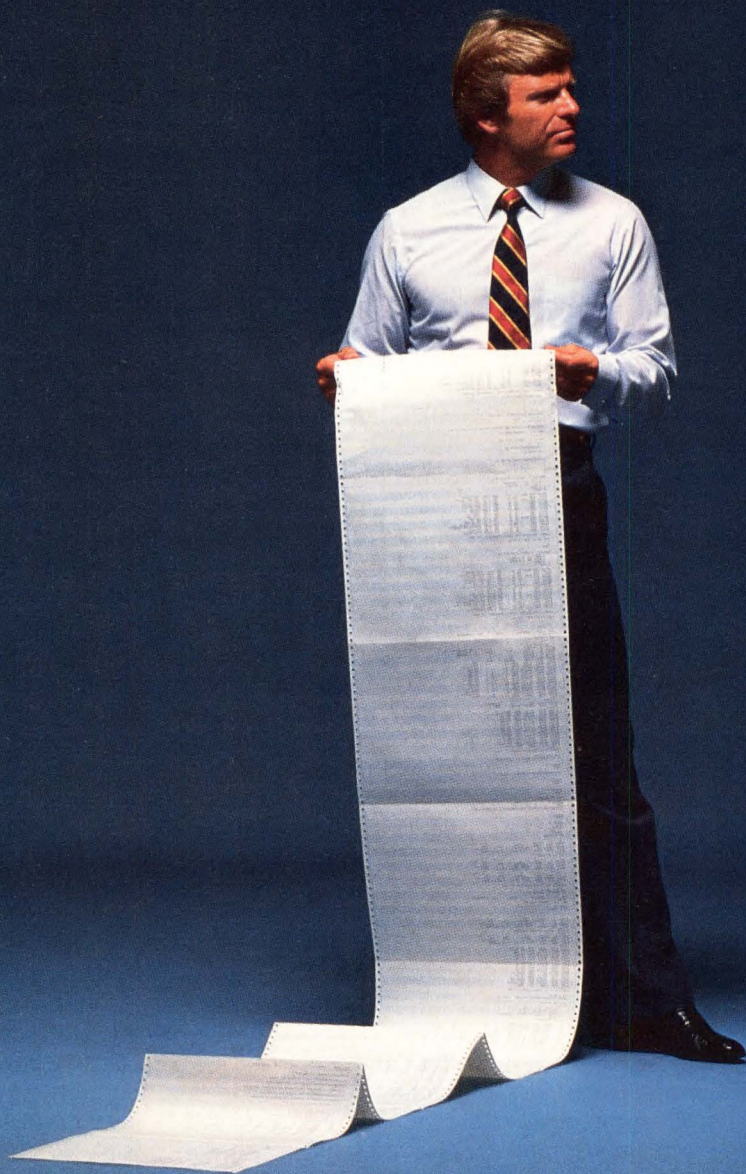


Figure \$50 a line for programming.

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MIND-PROBING: SCIENCE OR SCIENCE FICTION?

When hiring someone, you can never be sure that what you saw at the interview is exactly what you will get. Can consultants that administer pre-employment psychological tests successfully probe an applicant's psyche, so that you'll know what you're getting?

by Martin Lasden, Western Editor

Remember the Vulcan mind meld? Mr. Spock, from the TV series *Star Trek*, would perform this ritual whenever he needed information in a hurry from someone else's brain. "Our minds are merging," he'd say in a deep monotone. (His fingers would move slowly over the subject's forehead.) "Your thoughts are my thoughts. I feel what you feel..." And within seconds, Spock would know what he needed to know.

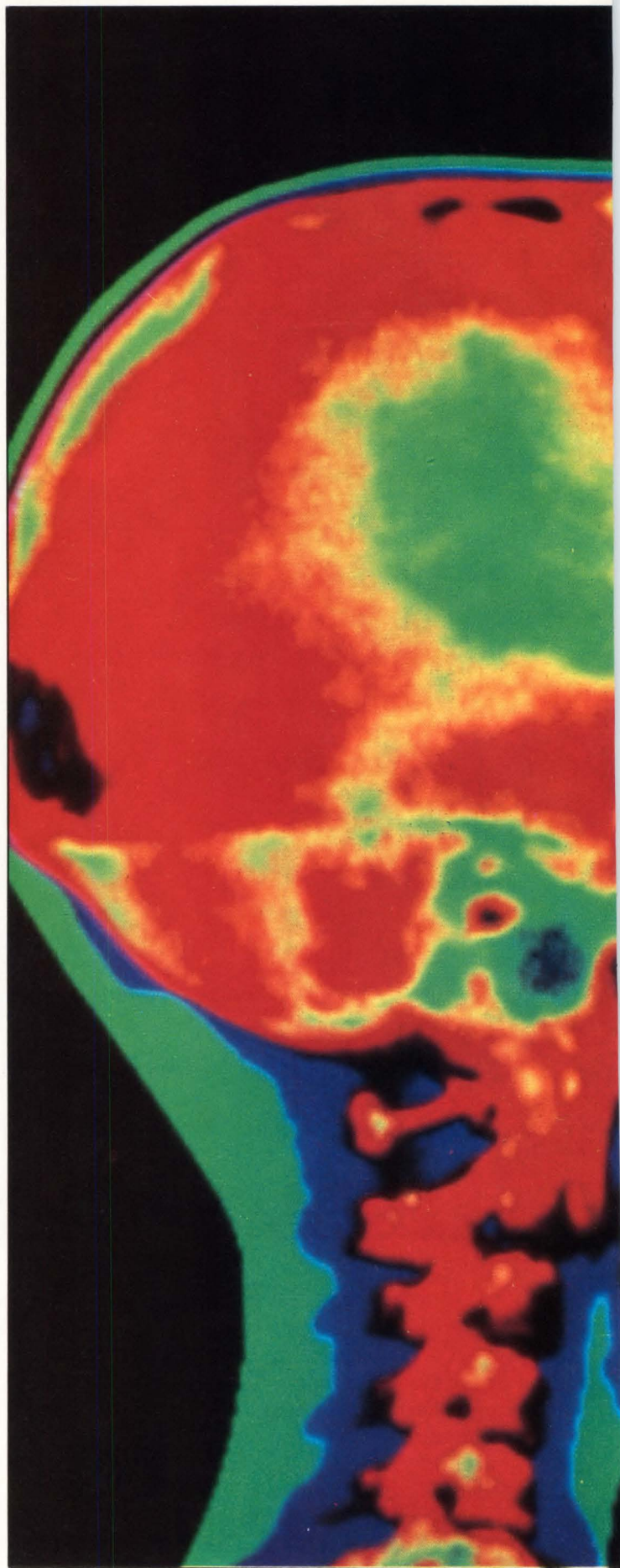
If you're a computer-involved executive with any sort of hiring responsibility, the prospect that such power might exist must be tantalizing. In high-tech, high-pressure, often high-turnover departments like those involved with computers, matching the right person to the right job is fraught with potential hazards. There are pasted-on smiles, exaggerated claims, and outright lies to guard against, not to mention the influence of your own deep-seated biases.

You do the best you can with the data available. But make a bad choice, or fail to pick up on the incompetence, laziness, and/or dishonesty of the candidate in question, and what was once a smooth-running operation can quickly turn into an unmitigated mess.

Wouldn't it be nice if you could eliminate that threat? Wouldn't it be nice if you could always be sure that what you see is what you're gonna get?

Enter the "mental measurers." Not Vulcans, but an assortment of consultants who claim the power to tap into the hearts and minds of applicants before it's too late; before you hire them, before you promote them, before the damage is done. All you have to do, the consultants say, is test them.

According to the 1983 edition of *Tests in Print*, there



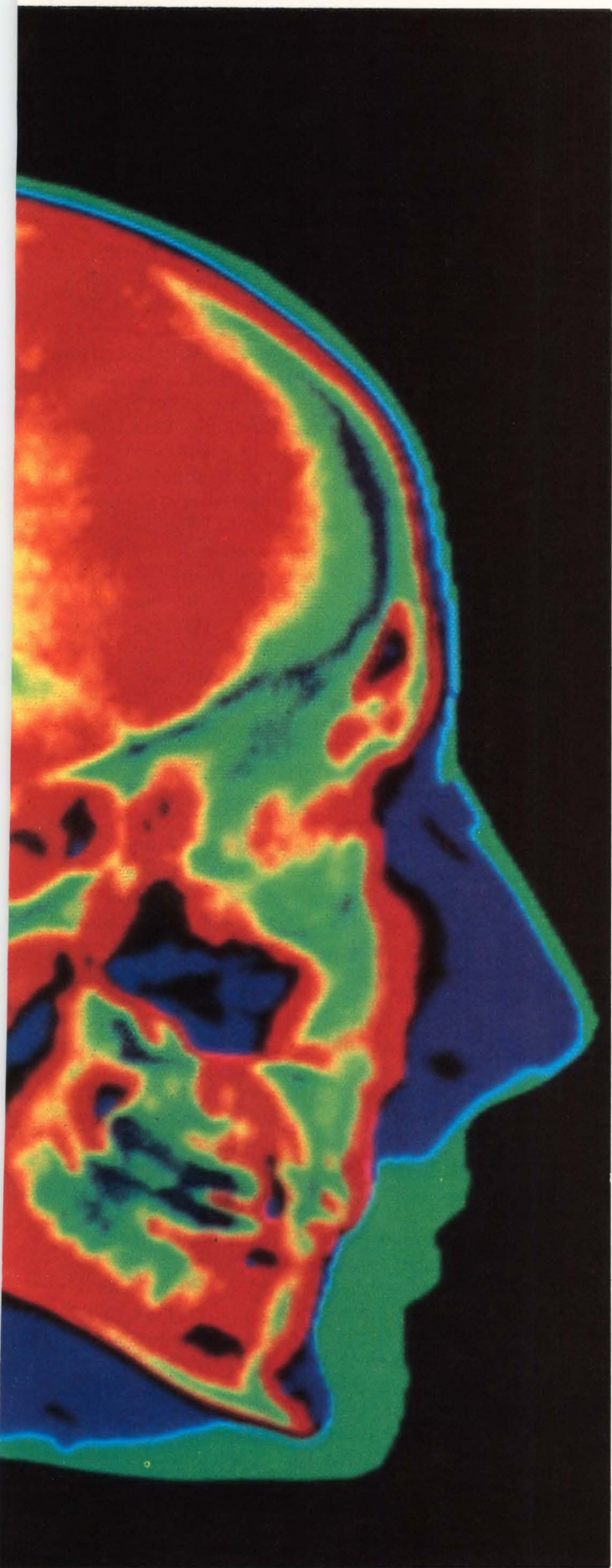


Photo by Howard Sochurek/Woodfin Camp & Associates

are well over 2,600 tests to choose from. It's said that these tests can measure anything from knowledge and aptitude to truthfulness and temperament of employees.

How do they do it? "Science," say the mental measurers. The science of testing, the science of psychology, the science of professional screening. But by wrapping the hallowed banner of science around themselves and appealing to managers where managers hurt most, the mental measurers often escape careful scrutiny. Mental measurement is, after all, more than just a science. It's also a big business. And where there's money to be made and clients to be won over, the trappings of science can mystify as well as inform.

George Dudley, president of Behavioral Science Research Press, researches the predictive power of tests, and he is blunt about the issue. Most personnel-screening tests are worthless, he says. "They're just not constructed under very rigorous conditions. They're often the sort of thing people put together on a Sunday afternoon over a few cans of beer."

Sloppy methodology does not, however, correlate to lackluster marketing. And in the testing biz, an effort is made to appeal to three frames of reference. First, there's the appeal of easy use. The line is: "With our tests, your tough selection decisions will be made easy." Second, there's the appeal of a breakthrough. "Only our tests supply the insight you need to make critical hiring decisions." And third, there's the appeal of science. "Our tests are scientifically proven." But, as Dudley asserts, when you really look at the tests, "there usually isn't any science behind them at all, except perhaps, the science of marketing."

Not all tests can be criticized in this way. Dudley cites a handful that have been subjected to rigorous validation studies and show merit. But even under the best conditions, tests are no substitute for human judgment. A test's ability to pick up on the nuance, the exception, the extenuating circumstance always has to be suspect because tests work by categorizing people, by putting them in neat boxes. And at best, they serve only as indicators, pointing the way for further questioning, investigating, and purposeful thought. To make them the final word in a personnel decision is to give them power they do not deserve.

Testing companies themselves acknowledge this. "We encourage employers to use their own judgment," says King Whitney, president of The Personnel Laboratory Inc. This Stamford, CT-based tester charges approximately \$200 to assess the suitability of a job applicant, rating the subject either a "good risk," a "fair risk," or a "poor risk."

"Our procedure is not infallible," Whitney admits. "And employers should look at references, work samples, and interviews as well as our assessments. . . . Tests are

Mind-Probing

(Continued from page 171)

like a carpenter's tools," he adds. "You don't blame the tool for a poorly made cabinet."

Even with such disclaimers, a damning report from The Personnel Laboratory may be the kiss of death for a job applicant. First of all, Whitney promotes his psychological-testing staff as a team of experts. Second, employers wouldn't buy the service if they didn't believe the promotions to be true. And third, if a manager is ready to hire a certain candidate, but the testing results are negative, would not that manager be hard pressed to go against the opinion of experts?

As the personnel director at an east-coast publishing company says: "There have been cases where people haven't been hired, and the test was a critical factor in the decision. . . . But I wouldn't want you to quote me on that." This company is among the clients that The Personnel Laboratory serves.

The danger is clear. Intimidated by the trappings of science, shaken by a lack of confidence in their own judgment, or perhaps just inclined to pass the buck, managers may let their voices be drowned out by the workings of an impersonal device. Consequently, they may lose not only the ability to critically assess that device, but also the ability to manage.

Shaky start

In the 1950s, personnel-screening tests in data processing got off to a shaky start with IBM's development of the Programmer Aptitude Test (PAT). As its name suggests, the purpose of PAT was to measure the aptitude of programmer applicants. (At the time, programming was a rather novel profession.) Most of the companies that used the test accepted its validity on blind faith.

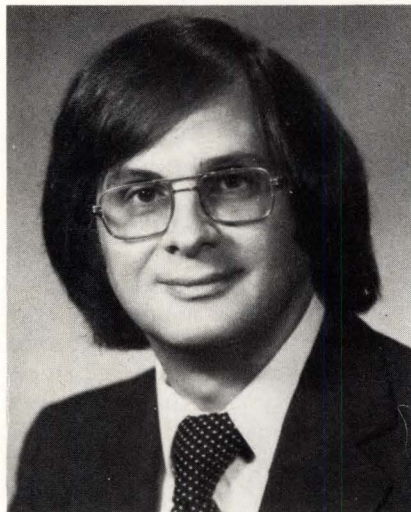
By the early 1970s, however, PAT became the target of scathing criticism. "Nobody has ever demonstrated that any of the programmer-aptitude tests was worth the money it cost for printing," wrote Gerald M. Weinberg in *The Psychology of Computer Programming* (Van Nos-

trand Reinhold, 1971).

In a paper presented to the International Federation for Information Processing (IFIP) Conference on Computers and Education in 1975, another critic, G. Penney, observed: "Year after year, such tests go their random way, possibly doing no more than bolstering selectors' confidence in their own procedures without regard to any harm they may do to the career or self-image of the applicants."

The PAT simply failed to pan out in controlled validation studies. One such study, on a group of undergraduate computer-science students, was conducted by Larry Mazlack, a computer-science professor at the University of Cincinnati. The only correlation Mazlack could find between the PAT scores of these students and their subsequent performance was how well they did on their first course exam. And it was a rather small correlation, at that. Moreover, says Mazlack, that correlation shrank to near zero as soon as the students started handing in their programming assignments. "There was no real relationship," Mazlack declares.

Similarly, in a nationwide survey of 233 programmers published in the 1967 Proceedings of the Fifth Annual



Most personnel-screening tests are worthless, claims George Dudley, a test researcher, and president of the Behavioral Science Research Press.

Computer Personnel Research Conference, Robert N. Reinstedt and his colleagues found very few cases where PAT scores correlated to supervisors' performance ratings. Among the top PAT scorers, half were rated by their supervisors as below-average programmers.

Other programmer-aptitude tests have since hit the market, and today there are three major vendors of them. Science Research Associates Inc. in Chicago is a subsidiary of IBM and sells the Computer Programmer Aptitude Battery. Psychometrics Inc. in Santa Monica, CA, sells the Berger Aptitude for Programming Test. And Wolfe Computer Aptitude Testing Ltd., based in Oradell, NJ, sells the Wolfe-Spence Programming Aptitude Test, the Wolfe Programming Aptitude Test, and the Aptitude Assessment Battery Test. All three vendors claim that their tests are vast improvements over the original PAT, and all three claim their products are rigorously validated.

At Wolfe Testing, Stephen D. Silver, president, faults the original PAT for not simulating the work of programmers very well. It was more like an IQ test, he says. This, he goes on to say, is the essential difference between his company's tests and PAT. To support his claim, he offers several of his clients' names.

"In general, the tests have worked out well," affirms Bob Bargerhuff, education coordinator for the State of Indiana's computer division. (Wolfe's tests have been used there since 1972.) However, while Bargerhuff believes in the tests, there are qualifiers attached to his testimonial. He has not, for example, chosen to greatly expand the use of such tests beyond novices who are applying to the department's training course. Silver claims his tests *can* measure the aptitudes of more seasoned applicants, but Bargerhuff isn't so sure.

It is also questionable whether these tests can predict the level of competence an applicant will reach. Although a programmer test may predict who will and who won't make



it through an introductory training program, distinguishing between the potentially great and the merely good applicant is another matter. (Silver claims his tests can do this but, again, Bargerhuff isn't so sure.)

Meanwhile, in a small number of cases at the State of Indiana, the tests were found not to predict well at all. It was each candidate's drive and ambition that made the difference.

"We had one computer operator," Bargerhuff recalls, "who did poorly on the test. But we promoted him anyway and he worked exceedingly hard. He went to school, was totally dedicated, and subsequently did quite well as a programmer. I suppose," Bargerhuff adds, "the test doesn't measure that sort of characteristic very well."

Such shortcomings notwithstanding, Bargerhuff maintains that the

Even under the best conditions, personnel-screening tests are no substitute for human judgment.

tests are generally valid. He says he's comfortable with a revised policy now in effect at his shop (promulgated by his superior) that prohibits the hiring of entry-level programmers if they don't attain a certain score. And he characterizes the low scorers who do subsequently excel as rare exceptions.

At Goodyear Tire Inc., on the other hand, there was talk of getting rid of the Wolfe programmer tests altogether. "We definitely turn away some good people," admits Kathy Easterling of Goodyear's personnel department in Akron, OH. "Some just don't test well, or when they take the test, they might be having a bad day."

Easterling also wonders whether the idea of programmer testing is outdated. Years ago, she points out, degrees in computer science were few and far between, and employers had

little else to go on. But today, such degrees are plentiful. What purpose does it serve to give the applicant yet another test?

MIS/dp managers at Goodyear were asked questions such as this last year. But after all was said and done, they opted to keep the tests anyway. As Easterling puts it: "The managers simply felt that they could do a better job of choosing employees with the tests than without them."

Whether it predicts job performance well or poorly, whether it's needed or not, a personnel-screening test that establishes a definitive cut-off between those who are hireable and those who are not is a seductive instrument. It has the power to turn what was once a burdensome decision-making process into a reflex based on the opinion of "experts." But what if the reflex is wrong? What if the test you're using does not do what its proponents say it does?

Then, it may not merely cause you to make a few hiring mistakes. It may also get you in trouble with the law. In discrimination cases in 1971 and 1975, the U.S. Supreme Court sent warning signals to managers. Speaking for the majority opinion in *Griggs v. Duke Power Co.*, 1971, Chief Justice Warren Burger wrote: "Any tests used must measure the person for the job and not the person in the abstract." In other words, not only must tests measure what they claim to measure, they must also measure what is clearly job-relevant.

To accept the validity of a personnel-screening test on blind faith, therefore, is to walk on very thin legal ground. The law encourages employers to maintain ongoing validation studies that show a definitive link between test scores and actual job performance, if those scores are to affect hiring. Like other methods of selection, tests need not be right 100 percent of the time, but the burden is on employers to show that those tests are fair and relevant. Thus, the notion that tests provide easy answers to complex problems is a very dangerous illusion.

This is particularly true when it

comes to personality tests that purport to measure traits such as aggressiveness, creativity, and leadership potential. The realm of personality is loaded with ambiguity. Also, critics charge that claims made for personality tests have rarely been substantiated. "The evidence suggests that there's virtually no benefit to personality testing," declares Lyle Schoenfeldt, a professor of management at Texas A&M University in College Station. "All it really is is a risk."

Frank Schmidt, a research psychologist at the U.S. Office of Personnel Management in Washington, says that the validity of such tests, like the validity of hiring interviews, depends largely on who's interpreting the results. "It's hard to know how good personality tests are, because you can't study every psychologist who gives them," he observes.

One assumption that has gotten personality testers into trouble is that the same instruments that detect serious mental aberrations can explore the personality characteristics of the typical job hunter.

Frances Berger, a principal at Psychometrics Inc., is an aptitude tester who neither sells nor believes in personality tests. She recalls one study in which the Minnesota Multiphasic Personality Inventory—a test widely used in clinical settings—was given to a group of programmers. Those programmers ended up scoring very high as psychopathic deviants. It's not that they really were psychopaths, Berger maintains. It's just that on questions relating to conformity, their answers leaned heavily toward nonconformity.

William H. Whyte, author of the book *The Organization Man* (Simon & Schuster, 1956), observed that

Mind-Probing

(Continued from page 173)

personality tests in general treat out-of-the-ordinary, innovative, and exceptional personalities with disdain. He writes:

"What would happen if the presidents of our largest corporations took the same tests by which future executives are being judged? What would happen if the tests were applied to a group of scientists, not just average scientists, but a group of the most productive ones in the world? Would their scores jibe with their achievements? By actually giving tests to 60 exceptional persons, we found out. Conclusion: If the tests were rigorously applied across the board today, half of the most dynamic men in business would be out walking the streets looking for a job."

Among the personality tests on the market these days, one of the most highly respected is the Sixteen Personality Factor Questionnaire, or 16 PF. It's a lengthy multiple-choice survey containing items such as: "I feel some punishment is coming to me even when I have done nothing wrong: a) often; b) occasionally; c) never" and "When I see 'sloppy' untidy people I: a) just accept it; b) in between; c) get disgusted and annoyed." It's claimed that by responding to 187 such items, those tested reveal 16 critical components of their personality.



Maximum Data Processing can't afford a big, fancy personnel department. So Joseph Corace, the company's president, employs a graphologist to corroborate hiring decisions.

"The 16 PF is one of the better tests," affirms George Dudley. As of 1976, he says, some 2,000 scholarly documents have supported 16 PF's accuracy. But even with such documentation, says Dudley, the test's real-world track record is spotty. Studying the relationship between 16 PF scores of insurance salesmen and their job performance as measured by how much they sold and how fast they sold it, Dudley found the correlation in one company to be amazingly high, while in another, it was almost zero.

In the real world, says Dudley, there are countless variables besides personality that can affect job performance—like the competitive standing of the company, the incentives it offers employees, or the state of the economy. These factors can accentuate or neutralize personality's impact.

In fact, Dudley says the most potent predictor of success he's ever seen is not the personality of the employee in question, but the personality of the supervisor. "We've seen *that* variable correlate as much as 33 percent of the time," he says. The applicant's personality, on the other hand, he estimates to correlate no more than 9 percent of the time.

The relevance of personality traits is, to say the least, unpredictable. Among Cobol programmers in an 18-month training course, Dudley found that only seven 16 PF factors definitely correlated to performance. In order of significance, these factors were: social warmth, practicality, self-control, independence, expressiveness, ability to tolerate frustration, and ability to learn quickly. The other nine factors seemed not to correlate at all.

With a test like the 16 PF, one must also be aware of how the evaluator's values can color results. Test scores of two different subjects may be the same, but what one psychologist calls "independence," another might call "a proclivity toward being alone." What one psychologist calls "cockiness" another might call "self-assurance." Such nuances of

language can tip the scales for the job hunter in insidious ways.

Then there's the "state-versus-trait" problem, or: Can a personality test distinguish between a temporary state and a persistent trait? For example, if you are angry at your spouse for not taking out the garbage, can the test determine that you're just angry at the time, as opposed to being an "angry person"? The developers of 16 PF claim that it can. But other experts aren't so sure.

You can't hide

Perhaps the most telling criticism leveled against personality tests is that job-hungry applicants who need a job more than they need an accurate personality assessment can—with just a little fibbing—come off as a lot more practical, independent, and in-control than they really are. But this possibility does not faze the mental measurers. They say they have the power to tap not only your conscious mind, but your unconscious as well, making it impossible to hide. Sentence completions, pictorial sketches, and inkblot interpretations are their means.

"It's a different kind of language," says Joanna Steinberg, a psychologist with The Personnel Laboratory, of the job seekers' sketches that she interprets. "There's less inhibition. There's less desire to conform. And drawing is harder to manipulate than people think. . . . We're looking more at structure and texture than content," she says.

A lot of employers give credence to these ideas, and Jack Frost, senior vice president of human resources at General Mills Inc. in Minneapolis, is one of them. Frost says that how a managerial candidate interprets a series of ambiguous-looking inkblots can be a "critical factor" in whether or not that individual is hired. The test is called the Rorschach, and it's administered at General Mills by Hay Associates, a prestigious New York-based consultancy.

Say you see in the inkblots flat, rather than furry, objects. One simple interpretation might be that you



have repressed feelings toward the people around you. But it's a lot more complicated than that. What the subject sees in terms of location, form, color, shading, movement, and content are all taken into consideration.

General Mills has screened its executives with the Rorschach test for the last 25 years. Frost says it really works. And he believes most experts in psychology also believe it works. He cites an obscure book by Zygmunt Piotrowski, Milton Rock, and John Grela entitled *The Percept-analytic Executive Scale: A Tool for the Selection of Top Managers* (Grune & Stratton, 1963) to support his case.

Despite Frost's opinion, however, projective tests like the Rorschach have been falling into disfavor over the last decade. The predominate opinion now is probably more accurately reflected in the words of psychologist Anne Anastasi, professor emeritus at Fordham University. Over the years, Anastasi has written a series of textbooks about psychological tests. In the latest (5th) edition of *Psychological Testing* (Macmillan, 1982), she writes:

"The majority of published validation studies on projective techniques are inconclusive because of procedural deficiencies in either experimental controls or statistical analyses, or both. This is especially true of studies concerned with the Rorschach. . . .

"It is a fundamental assumption of all projective techniques that the individual's responses to the ambiguous stimuli presented to her or him reflect significant and relatively enduring personality attributes. Yet there is a large and growing body of research data indicating that many other factors affect the individual's projective-

test responses. To the extent that retest reliability has been measured, marked temporal shifts have frequently been observed, indicating the operation of considerable chance error. More direct evidence regarding the susceptibility of projective-test responses to temporary states is provided by several experimental studies demonstrating the effect of such factors as hunger, sleep, deprivation, drugs, anxiety, and frustration on such responses. . . .

"The accumulation of published studies that have *failed* to demonstrate any validity for such projective techniques as the Rorschach . . . is truly impressive."

Handwriting off the wall

If you discount the validity of tests like the Rorschach, how do you feel about handwriting analysis? It's said that in Europe, as many as 85 out of 100 companies employ "graphologists" to inspect the handwriting of would-be employees, checking for both virtues and flaws of character. Graphologists believe that the way you dot your i's or cross your t's can reveal important aspects of your personality.

In this country, that concept is not nearly so popular. But there are a handful of graphologists who would like to make it so. One of them, Sheila Kurtz, is president of A New Slant (New York) and boasts 200 corporate clients. She is also the author of a new book entitled *Graphotypes: A New Slant in Handwriting Analysis* (Crown, \$12.95).

Kurtz says that as a graphologist, she is right 98 percent of the time. (Actually, she's a little unclear about this. Once she said she was "never" wrong; another time she said she was "very rarely" wrong.) She adds that handwriting analysis is not an art. It is a "science."

But how does it work?

"That's a good question," says Kurtz. "I'm not exactly sure, except to say that if you have an idea, it starts in your cortex, and travels down the nerve endings to whatever you're holding." A lot of good studies

have been done on this, she insists.

One of Kurtz' clients, Joseph Corace, is president of a New York-based service bureau called Maximum Data Processing. MDP is a relatively small company, Corace says, that can't afford a big, fancy personnel department. So Corace considers Kurtz' advice on who and who not to hire. At \$85 to \$200 a shot, Corace pays for as many as 18 analyses a year.

"I've used her services for over four years," he reports. "And during this time, turnover has decreased. I'm convinced it helps. I don't use it as the final word, but if I receive a negative analysis, I'll talk with the applicant some more and then draw my own conclusions."

To investigate graphology further, I had my own handwriting analyzed. I went to Charlie Cole, a Campbell, CA-based graphologist with 40 years of experience under his belt. Cole's credentials are impressive. He has a 17-line listing in *Who's Who in Gra-*

"Nobody has ever shown that any programmer aptitude test was worth the money it cost for printing."

Weinberg, author

phology World-Wide. He is the founder of the American Association of Handwriting Analysts, and a member of the Societe de Graphologie of France and the Institut Canadien de Characterologie Inc. Many organizations, Cole says, will not hire anyone without first using one of his analyses.

Cole told me to submit both my signature and a page-and-a-half of script. Content, he says, is not important, just handwriting. So I provided a rendition of "Goldilocks and the Three Bears," plus a little "Cinderella" to fill out the page. In response, I received a nine-page, double-spaced, typewritten report called a "High Tech Evaluation."

Naturally, I read the evaluation

Mind-Probing

(Continued from page 175)

with great interest. But as I went through it, I noticed that several statements seemed to contradict one another. On my competitive spirit, for example, the report says: "Your urge to win in competitive situations isn't very high, only 5.3. However, when you compete with someone, you want to show them you are the very, very best, with superiority drive at 6.0. Your ego comes into the picture here in a strong way."

Cole later explained what he meant by these seemingly contradictory comments. I probably try to avoid competitive situations, he says,

Graphologists believe that the way you dot your i's or cross your t's can reveal aspects of your personality.

but when I do compete I try to be the best.

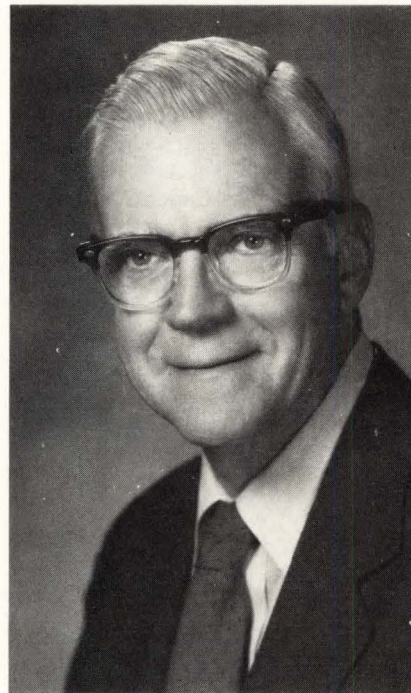
Another example: "Stamina, at 5.5, is a little low for a man your age. Perhaps it's just a passing thing." Then: "Get up and go: 7.0. Yes, this is something you like to do. You can bounce from one thing to another." What Cole meant here was that I take off like a shot, but because my stamina is a little low, I probably won't go very far.

How about this one? "The status money brings doesn't seem to be very important to you, only 5.5. You enjoy the finer things in life, but they aren't a prime necessity. Luxury-oriented: 5.5." Next sentence: "Money does give you a feeling of superiority: 5.7. Yes, money seems to be an important part of your day-to-day life." I tried to get Cole to reconcile these two statements as well. He spoke for several minutes about them, but when he was through, I still did not understand the distinction. However, just taking this report at face value, it seems that no matter who I was, if I wanted to, I could have found *some* truth in it. Are all such evaluations like that?



Some, at least. In an article in the *Journal of Agent and Management Selection and Development* (Vol. 1, No. 4, 1983), author Frank Scalia made the same observation. But first, he conducted a little experiment.

He presented graphology as a bona fide selection device to a group of insurance-agent supervisors and told them he had surreptitiously obtained samples of their handwriting for analysis. In sealed envelopes, he then passed out to each supervisor a copy of his or her "personal" report.



"Our procedure is not infallible," admits King Whitney, president of The Personnel Laboratory Inc., a Stamford, CT-based personnel tester.

After the supervisors finished reading, Scalia asked how many thought their analyses were fairly accurate. All did. Then he asked how many thought the analyses showed considerable insight. Again, all did. Finally, he asked how many thought it would be useful to obtain such information on prospective agents. Every hand in the room went up. When a volunteer began reading his report aloud, as Scalia requested, the room began to stir: Everyone soon realized that he or she had been given the same report.

Further negative evidence against

Projective tests like the Rorschach, when used to test job applicants, have fallen into disfavor over the last decade.

the claims of graphologists appears in "Predicting Sales Success Through Handwriting Analysis: An Evaluation of the Effects of Training and Handwriting Sample Content," an article in the *Journal of Applied Psychology* (Vol. 68, No. 2, 1983). Researchers Anat Rafaeli and Richard J. Klimoski found "no significant differences" between the predictive ability of graphologists and students who didn't know the first thing about graphology, but who were given the same samples to interpret.

Ironically, perhaps the most damning testimony of all comes from Charlie Cole. Preceding the written analysis of my handwriting, this astounding disclaimer appeared: "I want to make it clear that graphology can only reveal your potentials. We cannot tell whether you have, are, or will use these potentials. Also, it only reveals your potentials at the time of writing. The basic personality remains consistent. However, when under a great deal of emotional stress or turmoil, it may show changes." This just seems like a long-winded

(Continued on page 194)



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A photograph of a tugboat pushing a barge on a river. The tugboat is red and white, with a white superstructure. The barge is yellow and white, with the letters 'KNA' visible. The river is calm, and the background is a steep, forested hill. The sky is blue with some clouds.

DBMS On Personal Computers

BIG POWER In A Small Package

Choose the right DBMS and your personal computer can manage even the most cumbersome database. Choose the wrong one and your equipment's productivity can sink.

by Irene Shain Nesbit

A collection of corporate information is essentially useless if you can't find the data you need. One of the most powerful tools for organizing and accessing information is the database management system (DBMS). Traditionally used on mainframes and

minicomputers, this marvelous tool is now available for personal computers, too. It can also be used to create productive application software.

Micro database management systems soon may become as popular as spreadsheet and word-

processing packages. A staggering number of DBMS programs are already available—each touted as powerful, user-friendly (or relational), and able to manage, arrange, rearrange, and retrieve data in any way imaginable. How do you separate the hype from the



DBMS on Personal Computers

(Continued from page 179)

reality? It pays to look beyond the advertising and examine the fundamental principles of relational database management systems.

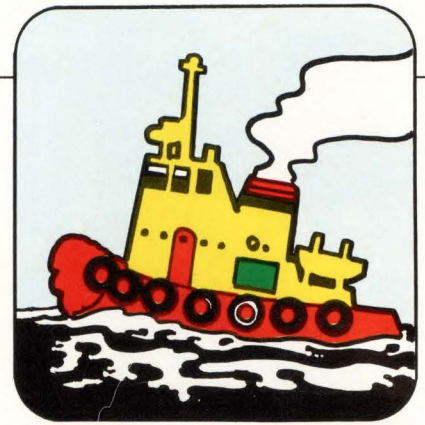
The most important feature of relational systems is that they fulfill the end user's needs for data storage and manipulation, as well as for ease of use. Users of relational systems perceive the database as simply a set of two-dimensional tables. Relational systems are also flexible; they allow the user to get almost any combination of information out of the database. And relational systems ensure data integrity; users are assured that the database will maintain its original structure and form.

Finding the right DBMS can be confusing and time-consuming. An understanding of the user's experience and computer knowledge, of the application's requirements, and of the system's overall organizational structure are all required to select the optimal DBMS.

The implementation of a DBMS on a mainframe is clearly intended to be accomplished by a programmer. Query languages and other interfaces have been designed to let the lay person access mainframe data. This is the difference between most microcomputer DBMSs and mainframe DBMSs—the micro package is simply handed over to the end user with the intention that the user will develop his or her own database application.

Microcomputer DBMSs also differ from mainframe DBMSs in size. The mainframe products support a large number of users working with very large databases. Mainframe DBMSs also include integrated data dictionaries; micro DBMSs—at least most of those currently on the market—do not. However, both micro and mainframe DBMSs recognize the relationships between pieces of information.

Microcomputer DBMSs are great



for databases that are extremely changeable and dynamic. Personnel departments, for example, use micro DBMSs to manage benefit information. The easy access to the data allows the departments to immediately respond to an employee question about benefits, as well as report to management the level of participation in education programs, benefit packages, and the like. Many professional partnerships use micro DBMSs to track and control project assignments and work in progress. Manufacturing, marketing, and other service departments are beginning to use the DBMSs for staff

DBMS on personal computers

Vendor	Package	Requirements	Price	Circle
ABW (313) 971-9364	RL-1	CPM, MS-DOS, PC-DOS	\$495	932
Alpha Software (617) 229-2924	Base V	MS-DOS, PC-DOS	\$425	668
ASAP Systems (408) 424-1300	ASAP Five	MS-DOS, PC-DOS	\$395	669
Ashton-Tate (213) 204-5570	DBase II	CPM, CPM-86, MS-DOS, PC-DOS	\$495	670
BPI Syst. (512) 454-2801	Info Mgt. Syst.	MS-DOS, PC-DOS	\$425	671
Business Library (213) 793-1700	Information Retrieval Volume	MS-DOS, PC-DOS	\$395	672
Capro (714) 891-1109	PRO-IV	8086	\$400 to \$6,000	673
Computer Control Syst. (813) 586-1886	DB-FABS	MS-DOS, PC-DOS	\$295	674
Concentric Data Syst. (617) 366-1122	CIP	MS-DOS, PC-DOS	\$395	675
Condor Computer (313) 769-3988	Condor	CP/M, MP/M, MS-DOS, CDOS, Turbo DOS	\$295/Condor 1 \$650/Condor 3	676
Contel Information Syst. (301) 654-9120	RTfile	TSX-Plus	\$2,500	697

Prices listed are the latest available. Your dealer may offer price cuts and discounts. Please check locally for the latest prices.

assignments, scheduling, and customer information.

Micro relational DBMSs vary greatly in complexity and function. Some are intended for the casual user, and others are designed for the seasoned technical programmer. Because packages, applications, and users can vary within an organization, many corporations use several micro DBMSs.

How can you decide which micro DBMS is best for your organization? A successful selection requires that you first understand the products available, then match your organization's needs to the optimal product or products, and finally establish the appropriate implementation processes. The following discussion of popular single-user relational DBMSs offers suggestions on how to evaluate their features.

One of the first DBMS systems for personal computers was Ashton-Tate's Dbase II. Critics of Dbase II

complain that only programmers can implement applications. Fans of Dbase II point to its tutorial, and assert that after a few hours of work on the system an end user can create a fairly simple database.

Dbase II is command-driven rather than menu-driven. It is written in assembly language and has its own structured development language. Some users have complained about the limited number of files that can be opened simultaneously, the various field restrictions, cryptic error messages, and slow operating speed. Joyce Monaghan of Executive Computer Network, a training and resource center in Fairfield, NJ, says Dbase II is "not simple to use." Monaghan believes complex applications require a serious dedicated user or programmer.

Because Dbase is used so widely, many vendors have developed add-ons to overcome the limitations and ease the complexity of developing

Dbase applications, as well as to capitalize on the large number of users who have already bought the product. In fact, Ashton-Tate has encouraged third-party vendors in an effort to make Dbase II a popular package for users of all levels of technical knowledge.

One of the more prominent vendors of add-ons for Dbase II is Fox and Geller, the developer of Quickcode, a product that eases the development coding of Dbase applications. Autocode I from Axel Johnson Corp., Dbase Window from Tylog Systems, and Dsolutions from Data Based Solutions of San Diego are other products that expand and solve many of the problems associated with Dbase II. The Dsolutions lineup includes Multi-column Report Generator, Global Change, Versa Label, Floppy Tracker, and Public Domain Software.

Many DBMSs have recently been put on the market. Some of the new

Vendor	Package	Requirements	Price	Circle
Cosmos (206) 496-5974	Revelation	MS-DOS	\$950	677
Data Technology Industries (415) 638-1206	Probase	CP/M, MS-DOS, PC-DOS, CP/M-86	\$650	678
Executec (214) 239-8080	ExecuFile	MS-DOS, PC-DOS	\$495	679
GMS Syst. (212) 947-3590	Powerbase	MS-DOS, PC-DOS	\$395	680
Information Builders (212) 736-4433	Focus	MS-DOS, PC-DOS	\$3,200	960
Innovative Software (913) 383-1089	TIM	MS-DOS, PC-DOS	\$495	681
ISE-USA (317) 463-2581	MDBS III	CP/M, MP/M, CP/M-86, MP/M-86, Turbo DOS MS-DOS, PC-DOS, Unix, Zenix, Unity	\$3,125 \$30,000	682
ITSoftware (609) 799-7500	KeepIT	MS-DOS, PC-DOS	\$450	683
Micro Applications Grp. (213) 700-1426	Mag	CP/M, CP/M-86, MP/M-86	\$295/Mag 1 \$495/Mag 2 \$795/Mag 3	684
Microdecision Software (303) 443-2706	Pillar	MS-DOS, PC-DOS	\$3,595	685
Microline (214) 592-3778	DMS III	MS-DOS, CP/M, PC-DOS 2.0	\$295	686

DBMS on Personal Computers

(Continued from page 181)

products might be better than Dbase II for your organization. In evaluating these products, it is critical to balance the technical sophistication of the user against the package's ease of use, yet still meet your application requirements.

Powerbase, from GMS Systems, is designed for end users in middle and upper management. It retails for

\$395. The system, written primarily in C language, has a datazoom feature, which provides access to records in different files that have at least one field in common with a file already being accessed. For example, if you are creating a project-management database, and one file contains information on the client, employees assigned to the project, and project

codes, you can also bring up the records of those employees who are listed in the project-management file. Designing the screens is a simple process, and the system, itself, provides features that allow an easy development as the application grows.

Powerbase also includes features to transfer files from other systems. Lotus Development Corp.'s 1-2-3

DBMS on personal computers

Vendor	Package	Requirements	Price	Circle
Microrim (206) 453-6017	R:Base	CP/M, MS-DOS, PC-DOS, CTOS	\$595	687
North American Tech. (503) 245-6585	Unify	68000, Z8000, Unix	\$2,995	698
O'Hanlon Computer (206) 454-2261	Sensible Solution Version 2.0	CP/M, MS-DOS Same systems	\$695 \$495	688
Oracle (415) 854-7350	Oracle	68000, 8086, PC-DOS	\$600 to \$2,000	699
Pacific Software Mfg. (415) 540-5000	Sequitur	Fortune, Onix, Plexus, Wicat, Unix	\$1,395 to \$4,500	700
Relational Database Syst. (415) 424-1300	Personal Informix	MS-DOS	\$695	689
Relational Syst. Int'l. (503) 682-3636	Pearl	MS-DOS	\$295	690
Relational Technology (415) 845-1700	Micro Ingres	MC 68000 under Unix	\$2,250 to \$3,000	691
Science Mgt. (201) 685-9000	Idol	SMC Basic under RSTS	\$595	702
Sensor-based Syst. (507) 867-4440	Metafile	PC-DOS	\$995	692
Single Source Solution (415) 680-0202	DBPlus	TI 99/4, 994A	\$100	703
Small Computer (201) 445-5643	Filepro	Apple II Plus, NEC PC 8000A, CP/M	\$199	704
Software Connections (408) 988-0300	LAN:Datastore	TI Professional; MS-DOS, PC-DOS	\$945	693
Stoneware (415) 454-6500	DB Master	Apple, IBM PC	\$350	705
Supersoft Assoc. (217) 359-2112	Personal Database	MS-DOS, PC-DOS	\$125	706
Systems Plus (415) 969-7047	FMS-80	MS-DOS, PC-DOS	\$995	694
Threshold Software (916) 920-8189	File/Idea	HP Series 80	\$70	695
Tominy (513) 984-6605	Database Plus	MS-DOS, PC-DOS	\$1,500 to \$5,850/depends on syst.	707
Software Publishing (415) 962-8910	PFS:File	Apple II, Ile; IBM PC; TI PRO	\$140	904
XOR (612) 938-0005	Thoth	MS-DOS, PC-DOS	\$100	696

DIF files and Dbase II's ASCII can be loaded into the system. As users change to newer products, these hooks and connections to other packages will become increasingly important.

Joe Glasthal, office-systems analyst at the Bank of New England in Boston, selected Powerbase for its relational capability and its menu-driven interface. He found the latter feature extremely important because the end users at his bank were accustomed to working with menus. At the bank, the advertising department was having its direct-mail work done by an outside service. Now, with the help of Powerbase, they do it in-house. The DBMS allows them to track the advertising inserts placed in newspapers. It processes letters to the respondents, tracks the names and financial-service information requested, and then creates the mailing labels.

Powerbase has excellent sample

databases that come with the product. Many users have modified the sample project-management database slightly to match their requirements. In addition, the Powerbase tutorial and documentation are well written and visually helpful.

Another product designed for the nontechnical end user is CIP, the Concentric Information Processor. CIP is for users who prepare reports from information retrieved from a database. The user "paints" the report by positioning field heading and contents anywhere on the screen and moving them around on a screen-by-screen or line-by-line basis. The facilities for data calculation and arithmetic are good, and the help program and manual are clearly written for end users. CIP is useful to users whose needs for reporting are stronger than their requirements for database management. CIP can integrate with 1-2-3, and read files from Dbase II and Software Publishing's

user-friendly PFS:File.

Some vendors are offering an integrated approach to database management: They build the same basic system for high- and low-end users. The integrated approach is usually achieved in these systems by making subsets of the higher version available at the low end. A prospective buyer needs to evaluate how easy the low end is for the casual user and how sophisticated the high end is for the knowledgeable user. Condor and Alpha each offer their one product with increasing degrees of sophistication.

The Condor Computer Corp. has two products: Condor 1 for beginners and Condor 3 (the relational database) for experienced database designers and users. Both Condor programs have been chosen by Hewlett-Packard to run on the new HP 150 touch-screen personal computers. There is full-screen setup and

(Continued on page 184)

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DBMS on Personal Computers

(Continued from page 183)

editing of record formats and data. Additions or changes to a field size or record, once the database has been loaded, require redefinitions and are not easy for the end user to do. However, Condor is powerful and can be used for complex applications.

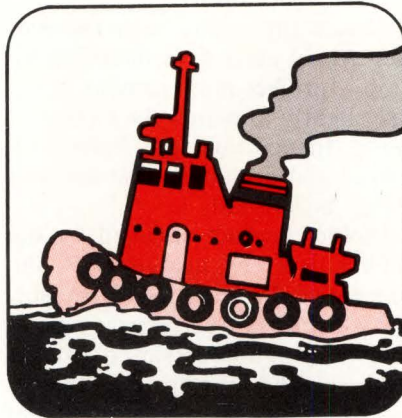
At the low end, in the same category as PFS:File, is Alpha Software's file manager for the non-programmer. It is menu-driven and has facilities to create form letters, reports, and labels. Its strength lies in its integration capabilities. Alpha's file manager can both read and write Lotus worksheets, so a user can create a name-and-address file in 1-2-3 and transfer it into Alpha to create mailing labels.

At the very high end of the current single-user systems is MDBS from ISE. It is sold in modules, and the price ranges from \$2,000 to \$10,000. It is used by systems professionals to develop complex and significant applications.

Larry Mathis, the project manager of mini and micro support for a division of Trans America Occidental Life Insurance, San Francisco, chose MDBS for its true relational features. Mathis sent his programmers to three days of training sessions sponsored by MDBS. The programmers report that they like the system for its sophistication and lack of constraints. They are developing an inventory-control system that will interface with C language or Pascal and Lotus. At Trans America MDBS will be used for applications development.

R:Base Series 4000, or R:Base, from Microrim Inc. is another interesting high-end product. R:Base evolved from Rim, a relational database management system developed for the NASA shuttle program.

R:Base, more so than most DBMS products, incorporates classic relational syntax, features, and capabilities. It has a data dictionary, which allows the user to define the database attributes and relations, set up rules for data validation, and inquire about the database structure and password specification. R:Base



allows 40 different files to be accessed simultaneously. The user can set up a direct interface between R:base and Multiplan and Dbase. The product is also compatible with the original Rim for access to mainframe and mini databases.

Knowledge-Manager, written in C language, is another DBMS designed to support many machines. Alvin Stroyny of Almark Enterprises Inc. is using Knowledge-Manager to develop cash and portfolio management systems. The ability to easily redefine the database was key to the choice of Knowledge-Manager for these applications. Stroyny also liked the integrated add-ons for graphs, forms, and text editors. He stressed that because the add-ons and the DBMS are all from one vendor, the degree of integration is greater than that of add-ons purchased from a variety of vendors.

Another high-end professional development tool is Revelation by Cosmos. It is written in machine code and makes use of the Intel 8087 chip for compiling operations. All files are compiled so that, unlike traditional databases, a "result" database is not created. Because of this design, Revelation is very fast.

Dan Darlington of DAR Associates in Fort Collins, CO, chose Revelation for a multi-level inventory application. This application will eventually migrate from an IBM PC/XT to a System/36. Revelation was selected in part because of emulation features that will make this upgrade easy. Revelation transfers and converts DIF and ASCII files, and

has security controls and unlimited field sizes at every level.

The same steps that an organization would take in acquiring and implementing any user requirement must be taken when a micro DBMS product is being considered. First the requirement must be well understood. If your company is trying to standardize on one or two products, it may be necessary to evaluate overall company requirements for micro DBMSs.

The next step is to examine the products that are candidates. Evaluate features and assess hardware requirements. Depending on database sizes and access times, the personal computers may have to be enhanced with more memory or a hard disk.

As when acquiring other types of products, you must test the DBMS before assuming a long-term commitment. The optimal process may be to choose three or four products as candidates and then test them in your company. In that way you can determine if the product features meet your requirements. If you do a pilot run with end users, you will also gain the necessary information about future training and support requirements.

The future of the micro DBMS is promising. Many multi-user DOS- and Unix-based systems will be announced over the next year. As 68000-based machines become more popular, successful systems that have been running on minicomputers will become available for microcomputers. Ingres, the popular DBMS on VAX machines, is already available as a microcomputer product for 68000 machines. DBMS products will continue to advance and improve as database management becomes widely accepted by microcomputer users. □

Irene Shain Nesbit is president of Nesbit Systems Inc., based in Princeton, NJ. Nesbit Systems is a software-service organization specializing in the use of microcomputers within large organizations.

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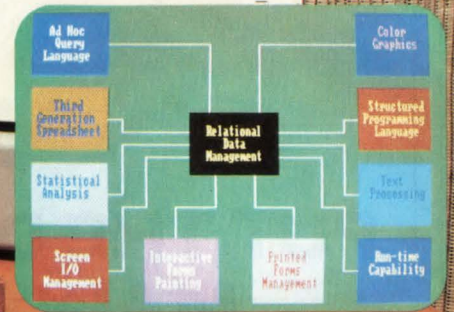
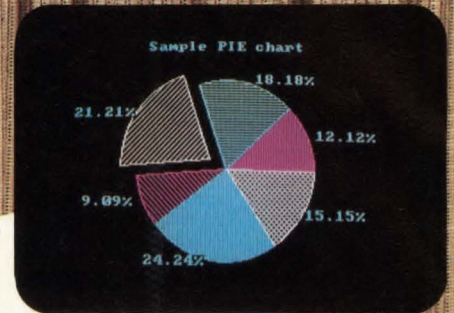
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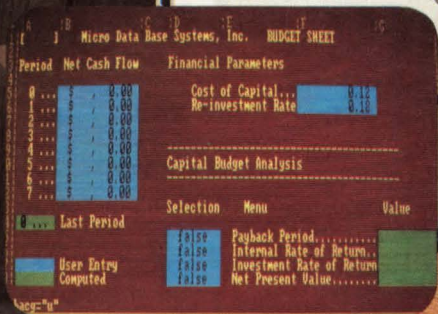
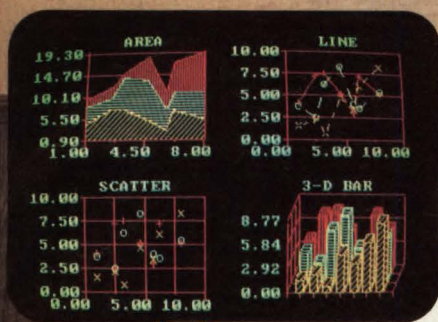
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by Mary Miles, New England Editor

YOUR CAREER

Type A personality: Bad business?

What one word best describes the Type A personality? Probably "aggressive." That one word fairly bristles with energy. Consider Webster's definition: "ready or willing to take issue or engage in direct action; militant; full of enterprise and initiative, bold and active, pushing." Possibly excluding the words "militant" and "pushing," what person—or organization—might not feel flattered to be described in such emphatic terms?

But according to Mark Lipton, assistant professor at the Graduate School of Management in the New School for Social Research (New York), the Type A behavior pattern, of which aggressiveness is a primary trait, isn't all that appealing. In his attempts to link Type A behavior with organizational characteristics, Lipton initially focused on sources of work-related stress. He then zeroed in on the types of behavior that various organizations look for in the people they hire and promote.

Lipton found that companies encourage, foster, and actually reinforce a particular type of behavior in their employees. But Type A behavior may not necessarily be healthy for organizations or individuals, in spite of the fact that it is often equated with success. According to Lipton, Type A behavior is actually inconsistent with effective management.

How so? To find out, we need to know more about Type A behavior. In the early 1960s, two cardiologists—Meyer Friedman and Ray Rosenman—began to study what they called coronary-prone behavior patterns. These patterns had a number of dramatic qualities: aggressiveness (sometimes approaching hostility), extreme competitiveness, the

need to be in control, perfectionism, the desire for power, impatience, and excessive "time-consciousness." Noting the high correlation between such personality traits and heart disease, they called this constellation Type A behavior. They classified Type B behavior as more easy going and less competitive. The doctors' findings are detailed in their book, *Type A Behavior and Your Heart* (Knopf, 1974).

Lipton discovered that organizations as well as individuals can exhibit Type A or Type B behavior. There's little doubt that today's society, with its increasing emphasis on fast-paced progress, technology, and urbanization, elicits Type A behavior from both organizations and people. It's not surprising that companies, forced to compete aggressive-

ly for survival in a fast-moving, dramatically changing world, seek out and reward those who can perform rapidly and aggressively.

According to Lipton, it may be situationally correct for a company to be Type A, in terms of what it has to get out of its workers, the type of market and economy it's dealing with, and the type of product or service it's providing. The trick is to determine when Type A behavior in the organization (or its employees) is desirable.

Here are some guidelines that Lipton offers to help you determine to what extent your corporation supports and reinforces Type A behavior:

- In this company, if you don't catch on right away, you're better off working someplace else.



Mark Lipton, assistant professor at the Graduate School of Management in the New School for Social Research (New York), says "The hardest thing about dealing with Type A people is showing them that their behavior is not responsible for where they are in terms of life success."

Breaking bad habits

If you're now convinced that you fall into the Type A category, don't lose hope. Here are some suggestions offered by Mark Lipton to help you break out of the Type A pattern and reduce the risk of damage to your health ... as well as improve your effectiveness as a manager.

- Reduce your tendency to think and speak rapidly by making a conscious effort to hear what other people say. Take a slow, deep breath every time you feel the urge to finish someone else's sentence.
- Attempt to do only one thing at a time. For example, while waiting for a phone call to go through, instead of trying to accomplish a second or third task, choose to relax—gaze out the window or close your eyes and breathe deeply.
- To reduce some of your self-imposed time pressure, allow yourself more time than you need to get the job done. This can only improve the quality of your work.
- Start your day 15 minutes earlier than usual, and do something nice for yourself. Leisurely read the newspaper, share breakfast with your family, walk the dog.
- Try to make your lunch hour a respite from work.
- Examine the games you and other people play, such as maneuvering, putting down others, stealing ideas, and currying favor. They are usually done for advancement, with little idea of what success really means.
- Recognize that reexamining what you value and want out of life is the first step to modifying or changing your behavior. Open up your eyes and be responsive to the world around you.
- Establish life goals apart from the eternal clutter and frantic pace of your career. Make peace of mind one of your goals. Set aside time for being with friends you really enjoy and stop socializing with people whose friendship you seek only for status.
- It seems as if most assignments in this company were due yesterday.
- It's not unusual for this company's employees to take work home in the evenings and on weekends.
- It's difficult for this company to understand an employee's point of view unless it coincides with the organizational view.
- Just about everyone in this company wants to get ahead and is willing to make whatever sacrifices are necessary to do so.
- This company's atmosphere can best be described as hard-driving.
- A good strategy for this company's

employees is to always look busy—even if they may be temporarily caught up.

If you're a Type B personality in a Type A organization, you're probably under some stress, and may even dislike your job. If you're a Type A, it would seem that you and the company were made for each other ... wouldn't it? Not necessarily, according to Lipton. Even if both you and the company are Type A, that doesn't automatically spell top efficiency, productivity, and prosperity for either party. To help understand why, let's take a closer look at what a

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CIRCLE 101

YOUR CAREER

Type A individual is like.

If your behavior has more com-
ponents of Type A than Type B, you
probably operate at full speed most
of the time. You frequently do several
things at once, such as jotting down
notes of what you want to accomplish
the next day while watching the news
on TV and gulping down a snack.
You *hate* wasting time.

You're not so much a commu-
nicator as a doer. An underlying ur-
gency in everything you undertake
causes you to set almost impossible
deadlines and goals for yourself. You
play to win and you don't hesitate to
express disapproval with the per-
formance of others.

Most Type A people believe they
cope well with this self-imposed stress
but Lipton disagrees. "The Type A
individual may exhibit maladaptive
coping behaviors," he says. "Under
pressure, he or she tends to deny psy-
chophysiological symptoms and may
lack the skills necessary to reduce
stress." This failure to control outside
tensions will ultimately result in
lowered efficiency.

While ignoring rather than coping
with stress, the Type A person is also
inclined to neglect his or her physical
health. "These people fail to see the
correlation between physical and
emotional well-being," says Lipton,
"and without your health your career
will surely suffer." Type A individu-
als consider exercise a waste of time
and when they do work out, they tend
to overdo it. "Type A joggers are no-
torious for running slightly beyond
their capabilities, frequently injuring
themselves," says Lipton.

The headstrong stubbornness of
the Type A personality can hinder
management skills. According to
Lipton, Type A people have trouble
delegating responsibility. They feel:
"The job's got to be done properly
and I'm the only one who can do it."
This attitude is especially trouble-
some when working in team projects
or cooperative efforts. These same
managers also deal miserably with
conflict and can often be hostile,
which means they are apt to be in-

effective at communicating, empa-
thizing, or understanding the prob-
lems of co-workers.

If all these characteristics sound
uncomfortably familiar, don't panic.
No one is totally Type A and there
are ways of shedding or softening
Type A traits while developing Type
B qualities. (Some of these are in-
cluded in the accompanying box.)
Moreover, not all Type A behavior is
negative. The need for achievement is
at the root of our desire to do a job
well—to succeed and perform in a
manner that makes us valuable to our
organization. It is only when the de-
sire for success impinges on our per-
sonal or family life that there is cause
to worry.

Many companies will not want to
hear that their most aggressive, com-
petitive employees do not necessarily
contribute to optimum productivity
and accomplishment of organiza-
tional goals. The Type A individual
might also be indignant: "Why
should I change my behavior? It's
what got me where I am today."

At this point, it is important to take
a closer look at the definition of suc-
cess. As you look at your behavior
pattern more closely, ask yourself
where it is getting you—and your
company. How effective does it allow
you to be as a manager?

If Type A behavior is inconsistent
with good health, job satisfaction,
and achievement of personal and cor-
porate goals, maybe it's time you
tried changes. With the increasing
perception on the part of today's
organizations that employees are
their most valuable investment,
chances are that these changes will
be recognized as beneficial. □

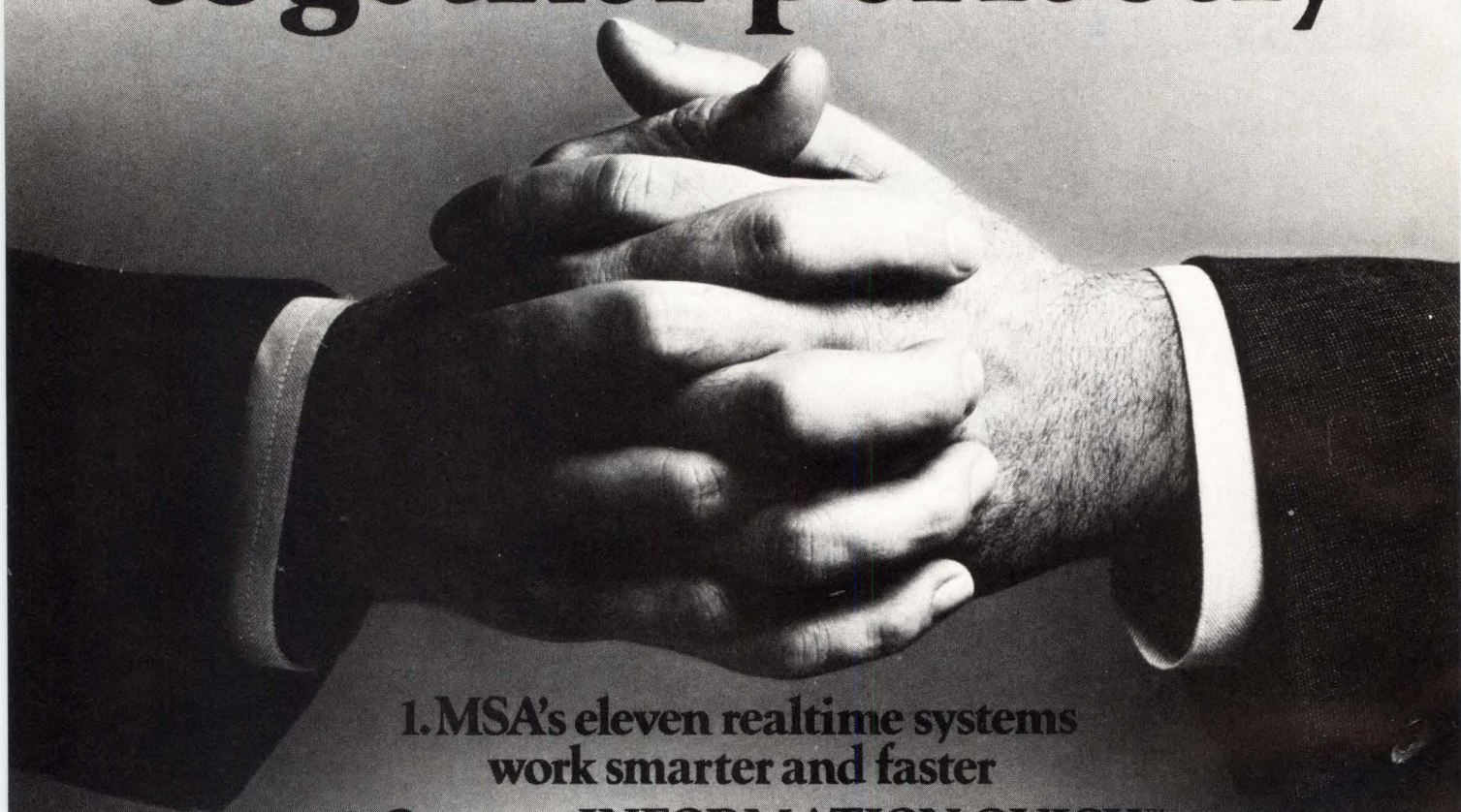
*Because of the unexpectedly en-
thusiastic response to the question-
naire presented in December's
column, "Attitudes toward absen-
teeism," we won't be discussing the
findings of that survey in a "Your
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SHOW PREVIEW

Computer Graphics Conference

The fifth annual Computer Graphics Conference will be held at the Anaheim Convention Center in California, May 14 through 17. Attendees will have the opportunity to evaluate and compare the latest advancements in computer graphics.

Over 25,000 professionals and managers are expected to attend the conference. Approximately 200 companies will be on hand to exhibit and demonstrate mainframes, microcomputers, workstations, terminals, software, and services. Special exhibitor forums will feature presentations by various manufacturers and vendors.

Computer Graphics '84 will be the first National Computer Graphics Association (NCGA) event to address the growing role of personal computers in computer-graphics applications. Vendors of graphics products for microcomputers have been encouraged to exhibit.

Over 70 technical sessions and 27 tutorials will explore the latest advances in graphics technology. The sessions will predict future directions in graphics and present computer-graphics applications. The tutorials will offer training in specific computer-graphics skills.

Among the offerings:

- Microcomputers in the corporation—a roundtable. Alexander Pournelle: Workman Associates.
- Graphics and micros in the infor-

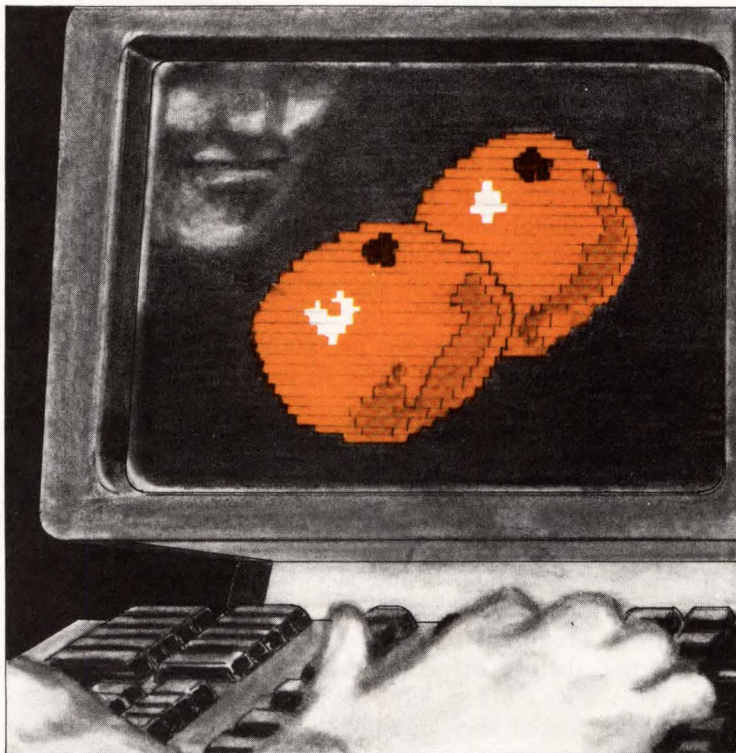


Illustration by Dan Culhane

mation center. David Ackmann: Monsanto Corp.; Chet Mills: Dialogue Research Service.

- Migrating graphic applications from hosts to micros. Mark Rawlins: Graphic Software Systems Inc.
- Microcomputers in the Rouse Corp.—a case study. William LaRocque: Rouse Corp.
- Innovative applications of computer graphics. David Ackmann: Monsanto Corp.; Mark Rawlins: Graphic Software Systems Inc.; Anders Vinberg: ISSCO.
- Reporting financial information—graphically. Can computer graphics really increase the value of financial data? Don Rudie: Dun and Bradstreet; Manfred Stansfield: Stansfield and Associates; Ed Tepper: Merrill Lynch.
- Future software directions. David Bailey: Sanders Associates;

Geraldine Cuthbert: Harris Corp.; Mark Rawlins: Graphic Software Systems.

- Introduction to computer graphics—part I and II. Alan Paller: AUI Data Graphics/ISSCO.
- Human factors in computer systems—a management perspective. James Foley: Computer Graphics Consultants.
- Selecting and integrating microcomputers into the corporate environment. Neil Chernoff: Booz Allen & Hamilton.
- Graphic design productivity through microcomputers. Peter Neuhaus: California State University.

- Graphics tools for understanding data. Marylyn McGill: MEM Research; Robert McGill: Bell Laboratories.

The price for tutorials will be \$185 for one half-day, \$285 for two half-day sessions, and \$355 for three half-day sessions. Technical sessions will cost \$235 for one day, \$360 for two days, and \$460 for three days. Registration for tutorials or technical sessions includes admission to the exposition. If you are preregistered, exposition tickets will be \$10. On-site admission costs \$20.

If you find yourself with a few hours of free time, consider making use of the discount tickets to nearby Disneyland that are being made available to conference attendees.

For more information about Computer Graphics '84, contact NCGA at (703) 698-9600. □

Mind-Probing

(Continued from page 176)

way of saying that the report proves nothing.

That you may have always been good at your work, and suddenly, are refused an assignment or a promotion because of the slant of your p's and q's is distinctly Kafkaesque. Not only might your stamina, competitive spirit, or love of money be subject to the mental measurers' scrutiny. So might your honesty.

Say there's been a theft in your department and your superiors want to uncover the thief. They take you to a room and hook you up to a strange machine. There are four attachments. One soft rubber belt goes around your stomach; another around your chest. And there are wires that fasten to the tips of two of



voluntary physiological responses occur. The polygraph is the most widely known detection tool, but there's another device, the psychological-stress evaluator (PSE), that measures tremors in the voice. There is no doubt that these instruments measure physiological changes. But such changes are not necessarily evidence of a lie. In fact, according to Lykken, machines like the polygraph can actually work in favor of pathological liars.

Still, some companies cling to their lie detectors, as the "Peanuts" character, Linus, clings to his security blanket. At one east-coast investment house, for example, any applicant that might handle stocks and bonds or access the company's computers is required to take a polygraph test before being hired. It's been that way since 1969. Applicants are asked such questions as: Have you ever stolen anything from a previous employer?

"We have the best back office around," says the MIS vice president there. "So, why should we change anything? . . . You know, I have this red sweater that I always wear when I go bowling. Maybe it's how the red reflects in my eyes; I don't know. But I wouldn't go bowling without it."

How long companies can hold on to those "red sweaters," however, remains to be seen. Sixteen states have already banned the use of polygraph tests as a condition of employment. Also, the EEOC has ruled that polygraph tests violate civil-rights laws. And on Capitol Hill, a congressional committee has recommended that the use of polygraph tests by federal agencies be prohibited in all but the most serious national-security and criminal cases.

"The whole process smacks of

20th-century witchcraft," Senator Sam Ervin Jr. once said of such tests. "The burden of proof should be on those who assert the efficacy of polygraph testing in predicting the behavior of prospective . . . employees. There have been practically no efforts to compile this proof. . . . Why, then, do (employers) have such blind faith in these devices? In my opinion, it is directly related to the role of science and technology in our society—the cult of 'the expert.' There is an increasing belief that anything scientific must be more reliable than the judgment of men."

If you've been dealing with technically engrossed colleagues for any length of time, you know what Senator Ervin was talking about—the jar-

The "mental measurers" say they have the power to tap not only your conscious mind, but your unconscious as well.

your fingers. This machine will become your judge and jury, and depending on what it "says," you could be out of a job. Sound farfetched? According to one survey in 1978, 20 percent of the nation's largest companies use such devices, commonly known as lie detectors.

The reliability of lie detectors is highly debatable. David Lykken, a professor of psychiatry at the University of Minnesota Medical School (Minneapolis), and author of *Tremor in the Blood: Uses and Abuses of the Lie Detector* (McGraw-Hill, 1981), maintains that there "has never been any credible scientific research proving the effectiveness of those tests in employment screening, or that they could save employers any money." In the studies that have been done, Lykken adds, the lie detector has been shown to be wrong one-third of the time, and was always biased against the truthful person.

The theory behind lie-detector tests is that when one is lying, in-

"Our managers felt they could do a better job of choosing employees with the screening tests than without." *Easterling, Goodyear*

gon, the insistent claims, the mystique of "experts" who put themselves beyond reproach. For years, that was the status a lot of MIS/department members enjoyed. And with that status came a lot of systems that didn't work, weren't needed, or couldn't be used. Mental measurers still enjoy some of the same status. And with their scientific methods, they say they can spot a good employment risk or a bad one a lot better than you could ever do it alone.

Employment-screening tests do have their place. In conjunction with interviews, references, and resumes, some can add a useful dimension to your hiring process. But the experts need to be treated with extreme caution. They have a way of getting around you, of assuring you, of wearing down your critical faculties. Accept their scientific analyses on blind faith, and you could be making a serious mistake. You could be making the biggest employment mistake of your life. □

Software Celebration

(Continued from page 158)

Top Secret not only standardized the bank's data-security provisions, but it also improved security, says Wicksell. The old system had no enforcement standards, and that opened the doors for errors, omissions, and accidental destruction of data.

IBM's Time Sharing Option (TSO) was the first facility put under Top Secret. Old passwords had to be changed to comply with Top Secret's standards, but Wicksell says the conversion was not difficult. Wicksell plans to bring the bank's batch applications and CICS online applications under the net in the near future.

Top Secret leases for \$900 a month, and runs on IBM mainframes under the MVS and MVS/XA operating systems. *Circle 892*

Upgrading security

Houston-based United Gas Pipe Lines Inc. also installed a utility package to upgrade data security. When the big (1983 sales: \$3.25 billion) energy transporter's data center converted its IBM 370/168 to the MVS operating system five years ago, Emily Lonsford, data-services manager, decided data security should be upgraded. Lonsford considered rewriting the old security system, which was based on IBM's SVS, but eventually decided to install ACF2 from Cambridge Systems Group.

"Our main concern was protecting the integrity of production data," says Lonsford. "As soon as the utility package was installed, our production data were secured." Preserving data integrity usually has little to do with shielding against the intrusions of hackers. For example, shortly after ADF2 was installed, it alerted a programmer who had confused the master payroll production file with a test file. Two years after the package was installed, United Gas Pipe Lines replaced its IBM 370/168 with an IBM 3083. ACF2 plays the same vital role on the new machine—it helps data-center staff manage the 650 users who access the host computer.

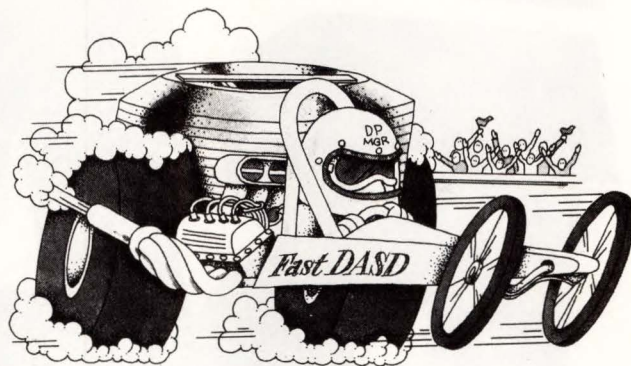
The successful implementation of ACF2 prompted Lonsford to try another Cambridge Systems data-center-management utility when the data center was moved to new quarters in May 1982. To prepare for the move, all the corporation's data

were transferred to an IBM 4341. ASM2, a disk-management utility, tracked the test datasets, automatically moving those that had not been used for 30 days from disk packs to tape reels.

(Continued on page 198)

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Software Celebration

(Continued from page 195)

The disk-management utility has streamlined operations, says Lonsford. The corporation's 3083 mainframe now runs more than 5,000 batch-production jobs a month, up from 1,800 in 1980.

ACF2 runs under the MVS, VS1, or VM operating systems and costs \$21,000 to \$29,700. ASM2 runs under OS/MVS or OS/VS, and costs \$19,500. *Circle 893*

Keeping pace with expansion

Pacesetter Corp., an Omaha, NE-based door and window manufacturer, also installed a data-center-management tool. Sales growth over the last three years had outstripped the data center's ability to cope. Sales jumped from \$42 million in 1980 to \$62 million last year, an almost 50 percent increase.

As sales grew, information-processing systems were expanded to keep pace. New programs were added to manage the expansion and the demand for facilities to store and manage information leaped. A particularly tough problem was managing a tape library that tripled in size, says Phil Klein, systems-software manager. Keeping track of tapes became a major problem. Scheduling conflicts hampered smooth operations. "As if contention for tape drives and reruns because the wrong tape had been mounted weren't enough," says Klein, "just finding the right tape for a job became a chore."

Klein had worked with EPAT, a tape-management utility from SDI, in a previous job, and he installed it on Pacesetter's 8-Mbyte IBM 4341 to help improve tape management. EPAT has eliminated the contention and tape-location problems that plagued operations, he says.

The package is also saving the manufacturer two hours of operation time each day by streamlining tape utilization. Without EPAT, Pacesetter's IBM system requires that a tape be installed on a tape drive during the full run of a particular operation. EPAT enables the data-center

staff to unload the tape after data are loaded. Thus, individual tapes don't tie up the tape drives during operations.

EPAT runs on any IBM system under VS or VSE and sells for \$10,200. *Circle 894*

Check for errors

Data-processing errors are a costly and frustrating drag on efficient data-center operations. But they're simply intolerable for information-critical organizations.

The United Bank Services Co. (Englewood, CO), a data-processing subsidiary of United Banks of Colorado, Denver, is one such organization. Before the package was installed last July, operations were being hampered by input/output (I/O) errors. Jeff Williams, operations support supervisor, decided to take action. He installed Data Check Recovery (DCR) from Software Corp. of America to eliminate the errors.

Williams describes the utility as an emergency tool. "What's the cost to us if our customers have to do without online banking for an hour? Plenty," he says. "DCR is kind of like a fire extinguisher." Although it is newly installed, DCR has already been used to recover a database. Says Williams: "Without DCR, we would have needed eight to 10 hours to recover the database. DCR solved the problem in a few seconds."

DCR runs on any IBM mainframe under MVT, SVS, VS1, or MVS, and sells for \$5,900. *Circle 895*

A czar for scheduling

Fast-growing Pinellas County, FL, turned to a scheduling utility to eliminate errors and reruns caused by a burgeoning demand for services. The county, which takes in the cities of Tampa and St. Petersburg, is Florida's third-largest, with 780,000 residents. The county data center, built around a 6-Mbyte NAS AS/5000 and an 8-Mbyte IBM 4341 with 700 terminals, is the nerve center for the

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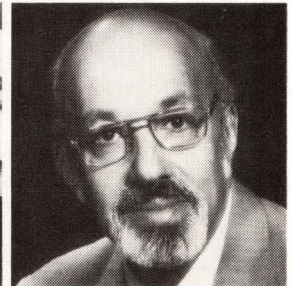
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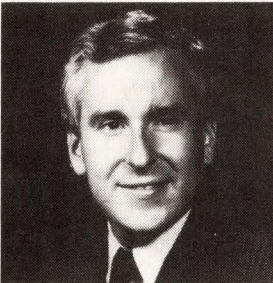
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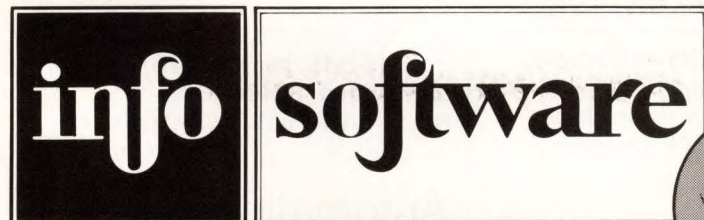
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Software Celebration

(Continued from page 198)

courts, the county legislative body, the tax collector and assessor, and the chief law enforcement agency, the sheriff's department.

During the last several years, as the Tampa Bay area has rapidly grown, the county data center began to feel the strain, says Gary R. Rymer, department head. The batch-processing workload became heavier and heavier, and forgotten jobs, out-of-sequence jobs, and reruns became more numerous. With no end of county growth in sight, Rymer decided to seek an automated solution. A workload study had recommended that Pinellas County install an automatic-scheduling package, and Rymer installed CSAR—Comprehensive Scheduling and Reporting—from Software Concepts Inc.

CSAR automates scheduling for the crush of projects facing the data-processing department. CSAR automatically submits jobs to the main-



Bob Wicksell, manager of data security for First Tennessee Bank, checks activity in the Top Secret security utility.

frames, minimizing the need for operator intervention. Installation of CSAR let Rymer cut his staff of production controllers in half—from six to three. Rymer reports that lost jobs are almost nil and the job-setup errors that cause task reruns have been reduced by 60 percent to 70 percent.

CSAR costs \$11,500 for DOS-based systems and \$34,500 for those running OS. *Circle 896*

Disk-maker cleans up its own disks

Storage Technology Corp., Louisville, CO, is a major manufacturer of disk drives (\$922 million in sales last year), but until early last year, it was having trouble managing its own disks. When Phil Graves took over as DASD (direct-access storage device) manager in January 1983, he found that 90 percent of Storage Technology's disk space had been allocated, but only half of it was being used. "Users would overallocate disk tracks and never use them," says Graves. "In some cases, as many as 30 tracks had been reserved by users who needed only one."

Inefficient apportioning of disk space is often a problem for growing companies and their data centers. Storage Technology had increased the capacity of its data center, which is anchored by two Amdahl V-8s and a V-6, but failed to improve disk management. Overallocation is not only inefficient, but it also causes confusion over which data are stored on which disk packs.

Graves turned to DMS/OS, a disk-management utility from Sterling Software Marketing, for help. "DMS/OS gave me a handle on what was happening with our capacity and explained why we were short of it," he says.

DMS/OS runs on IBM mainframes and PCs under VS1 and MVS. Prices start at \$12,000.

Circle 897

Automating from the ground up

One kind of utility package helps organizations convert manual procedures to automated systems. At Carraway Methodist Medical Center, (Birmingham, AL) and the Assemblies of God (Springfield, MO), the goal and the method were similar. Both set out to automate manual in-

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Software Celebration

(Continued from page 200)

formation systems and both installed utility packages to speed the process.

Carraway Methodist used SAS and SAS/FSP from SAS Institute Inc. to speed the conversion of 20,000 medical records to a new medical-records abstracting system ordered by the hospital administration last June. Using SAS and SAS/FSP, the medical-programming staff compressed a project that usually takes about six months into a single month.

The hospital administration was forced to change over to an automated patient-records system by a revision of the federal Prospective Payment System. Under the old method of billing, Carraway Methodist collected fees based on the amount of time patients spent in the hospital. Under the new plan, which took effect last October, the government reimburses hospitals based on patient diagnoses. "We might get paid \$2,000 for an appendicitis case, whether the patient spent one or 10

days in the hospital," says Ted Reynolds, medical-programming chief. "We weren't prepared to operate according to diagnoses. We needed a system that could group diagnoses."

Reynolds had a tight deadline to complete the installation. He and his staff, some of which had no data-processing experience, installed the new system on the hospital's 12-Mbyte IBM 4341 in 412 programming hours.

Before installing Text Retrieval System/Online (TRS/OL) from MacKinney Systems Inc. in late 1982, the Assemblies of God faced a similar problem with an inefficient manual system. The organization maintains a variety of ministries and programs; every few days, top officials of the foreign-missions division meet to discuss the activities and needs of more than 1,200 missionaries in 100 countries. Under the old system, the minutes of these meetings were typed, filed, and manually

indexed by individual missionary, location, and subject. When the officials needed to refer to a previous decision for guidance on a pending matter, they couldn't always find the pertinent case.

Enter the systems and programming departments and TRS/OL. The package, running on the Assemblies of God's IBM 4341 and 370/148 mainframes under DOS/VSE on a CICS network, makes information retrieval reliable and it is easy to use.

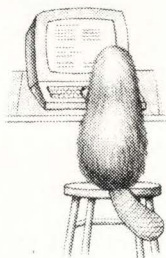
TRS/OL replaced a comprehensive manual indexing project at the Assemblies of God. Now, old minutes are being entered into the new system. Minutes from current meetings are entered directly.

SAS (\$7,900) and SAS/FSP (\$4,900) run on IBM 370, 43XX, and 30XX mainframes. *Circle 898*

Text Retrieval System/Online runs on IBM mainframes and sells for \$5,000. *Circle 899*

(Continued on page 204)

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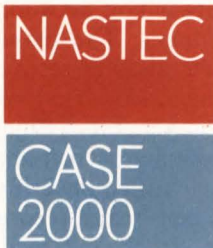
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Software Celebration

(Continued from page 202)

Preparing for the worst

Some utility packages serve specialized functions—like helping to formulate a disaster-recovery plan. Signode Industries, Glenview, IL, installed Contingency Planning System (CPS) from CHI/COR Information Management Inc. to help plan for the worst.

With \$700 million in sales last year, Signode manufactures strapping and packaging equipment. An Amdahl 5860 mainframe is at the heart of its online network of IBM 3270 terminals. The manufacturer approached disaster-recovery planning in stages, says Vic Fricas, operations manager. First, Signode used CPS to complete a risk-analysis report that identified the critical applications to be run at a recovery site if a disaster struck and to determine which computers and peripherals

would be needed to run those critical applications.

The next step was to determine which data files should be stored, in readiness for disaster, in a separate facility. A component of CPS called System Management Facilities analyzed the requirements of the critical applications, and generated a list of critical data files and disk volumes.

CPS, priced at \$10,000, runs on any IBM or PCM under MVS or VSI.

Circle 900

Reviewing troops via computer

For senior officers at the U.S. Army Aviation System Command in St. Louis, reviewing the troops is as easy as pressing a button to call up one of 200 computer graphics charts filed on an IBM 4341 computer. "The deputy commander can look at a series of computer menus and, by pushing a button, go through func-

tions and topics until he gets the decision-support-graphics chart he needs," says Joe Au Buchon, chief of scientific engineering applications at the base. The charts provide information on all departments and projects under the Command.

"Our goal is 600 to 700 charts," says Au Buchon. "We'll push the total to between 1,200 and 1,500 charts eventually." The 200 decision-support-graphics charts are only a portion of several thousand charts generated in various divisions at the 8,000-person base using the IBM 4341 and ISSCO's Tell-A-Graf, a plain-English database utility package. Another section of the Command, the material-management division, has already generated more than 1,000 charts during the last two years, says Au Buchon.

Tell-A-Graf is machine-independent. It costs between \$9,500 and \$25,900.

Circle 901

(Continued on page 206)

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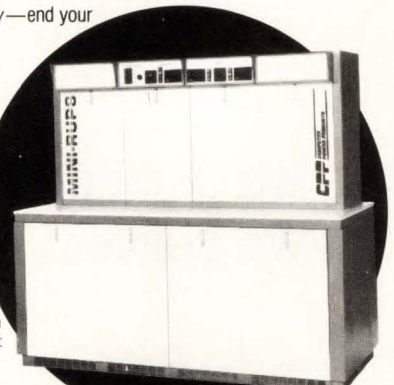
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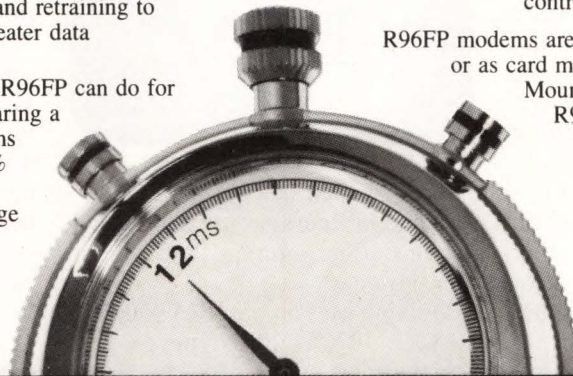
The Rixon R96FP Fast Polling Modem is living up to its name by being the fastest polling modem in the industry with a 12 ms turnaround time.

These 9600 bps modems are V.29-compatible and operate synchronously over four-wire unconditioned 3002-type private lines. Designed for point-to-point and multipoint (multidrop) polling networks, the R96FP's advanced technology provides rapid equalization and retraining to obtain the 12 ms RTS/CTS delay for greater data throughput in polling networks.

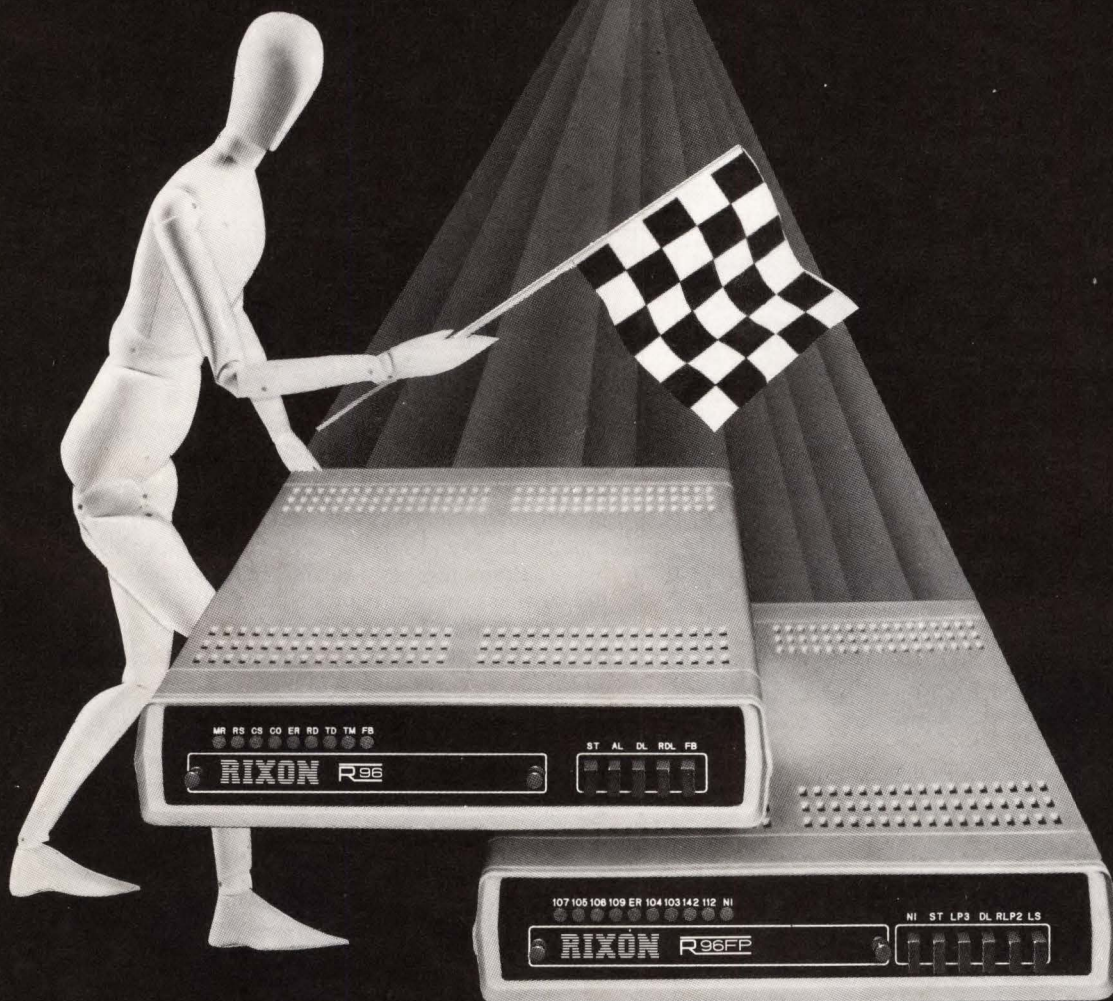
The following example shows what the R96FP can do for you. In a typical polling network comparing a competitor's fast polling modem at 30 ms with Rixon's R96FP, you will have 78% more polls and an 85% increase in data throughput with the R96FP. If you change your network, you can decrease the number of computer ports by 40%, decrease your backbone lines, or

increase the number of drops by 80%. In the test mode, the hub modem can poll, address and perform tests on up to 100 tributary modems. In using the master/tributary configuration in high-speed, point-to-point applications, the modem operates at 9600 bps with fallback speeds of 7200 or 4800 bps. Fallback speed is enabled by a modem front-panel pushbutton. Tests of the modem, line and terminal are controlled by other front-panel pushbuttons.

R96FP modems are available as compact standalone units or as card models for mounting in the RM90 Rack Mountable Card Cage. The list price of the R96FP is \$2995, and \$2595 for the R96 point-to-point modem. For more information call Bob Sagolla at 301-622-2121 extension 327, or write to RIXON INC. at 2120 Industrial Parkway, Silver Spring, Maryland 20904.



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CIRCLE 112

Celebration

(Continued from page 204)

Learning tool

Turning out data-processing professionals in 11 weeks is a tall order. "We have 11-week quarters, and that's a very limited amount of time in which to teach a course," says Jeffrey E. Held, dp instructor at Guilford Technical Institute, a community college in Jamestown, NC. GTI's program emphasizes practical applications of data processing, rather than theories. Traditional programming languages like Cobol require too much training time for GTI's accelerated schedule. The time spent learning the language could be spent programming, says Held.

The solution for GTI is Quikjob from System Support Software Inc. Quikjob is technically a data-management tool, but Held considers it to be much more. "It is such a versatile system," he says, "that we use it as a utility, a programming language, and a database management system."



The package has become the cornerstone of courses on Cobol, RPG, systems programming, and assembler languages.

Quikjob runs on the IBM 360, 370, 43XX, 30XX, and Sperry's 90 Series. Prices start at \$5,445.

Circle 902

Fine-tuning hardware

Data-center specialists can't tune up hardware without detailed information about system performance and resource utilization. Epsilon Data, Burlington, MA, uses Jars (Job

Accounting Report System) from Johnson Systems to get this kind of information.

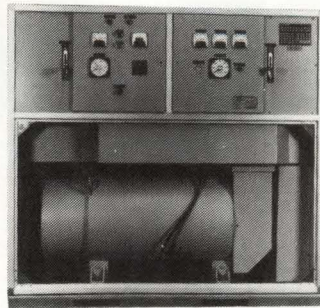
Epsilon Data, with 600 employees and \$22 million in sales last year, provides computer services to direct-marketing clients. It has two IBM 4341 computers. "The easy-to-understand reports generated by Jars help us to spot and correct input/output and throughput problems," says Bob Bicknell, manager of systems programming. Previously, evaluating system performance meant wading through heaps of piecemeal reports.

Jars provides information on *overall* system efficiency. For example, it analyzes the utilization of the central processing unit by system and applications programs. It indicates how much and when an I/O device is used.

Jars operates on IBM 370, 43XX, and 30XX, and sells for \$12,500.

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- Master Degree in Computer Science
- Several years of working experience in computer center
- Ability to recruit and train new staff
- Knowledge of MUS

JOB DESCRIPTION

- Managing the Computer Center
- Teaching some computer courses
- Training personnel for the computer center
- Improving computing facilities
- Developing computer programs for the University Branch Administration and the College

B. PROGRAMMER

QUALIFICATIONS REQUIRED

- Bachelor Degree in Computer Science
- Minimum of two years relevant experience
- Arabic knowledge will be an advantage but not conditional

JOB DESCRIPTION

- To assist in Programming Courses
- To assist in Training new staff
- To contribute the development of administrative system and scientific programs

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Intended Applicants are kindly requested to send their application letters indicating the position applied for together with photocopies (non-returnable) of their academic diplomas and specialized experience certificates, and an updated resume to the following address:

**KING SAUD UNIVERSITY
ABHA BRANCH
COMPUTER CENTER
P.O. BOX 418
ABHA — SAUDI ARABIA**



A second copy of the above mentioned information should also be mailed to

**KING SAUD UNIVERSITY OFFICE
2425 WEST LOOP SOUTH #450
HOUSTON, TEXAS 77027
Attention: Ms. Nikky Amin**

Qualified candidates should furnish their correct addresses and telephone numbers where they can be reached for notification of place and date of scheduled interview.

Applications will be held in strict confidence.

LETTERS

Sorry, wrong number

Superzap/38 is too valuable a software product for System/38 professionals to let a misprint on page 250 of your January issue go without correction. Please inform your readers that our correct phone number is (805) 583-8440.

John R. DeGregorio
President
Ventura Computer Systems
Santa Susana, CA

Sorry, wrong price

We were pleased to see Dumpmaster by Macro 4 Systems Software included in your feature, "Software for a smooth-running data center" [January]; however, I hasten to advise that this product leases on a one- or two-year charge of between \$100 and \$300, depending on the features required and the operating system (DOS or MVS/OS/VS1). It does *not* cost \$3,000 per month, as indicated in your table.

Geoff R. Parnell
Director of Marketing
Macro 4 Inc.
Mt. Freedom, NJ

Sorry, wrong list

Your December article, "New lift for mass storage," included our FMT software package in a list of "Selected shoe-horning packages." The implication is that FMT is a general-purpose utility for disk-storage management. This is incorrect.

While we appreciate your editorial mention of our product, we would like to set the record straight so your readers will not be misled.

FMT is an enhancement to Data General's Extended Basic under AOS and AOS/VS that provides ISAM file-management capabilities. In effect, it converts DG's language into a multi-user commercial Basic. Furthermore, it enables AOS users to run MCBA's line of accounting packages.

Bert Seidlitz
President
Banana Computer Showroom
Silver Spring, MD

Likes free-agent analogy

Thank you for Ara C. Trembly's "How to land top talent" [February], in which my comments appeared. The article was innovative, well organized, and well written. It should wake a lot of people up to the idea that they need to make an effort to keep their top personnel. I really liked the "free agent" comparison, and I appreciated the fact that this piece was brief and concise.

Ronald C. Stefanowicz
Director, Information Systems
Middlesex General-University Hospital
New Brunswick, NJ

Address letters to the editor to Computer Decisions, 10 Mulholland Dr., Hasbrouck Heights, NJ 07604.

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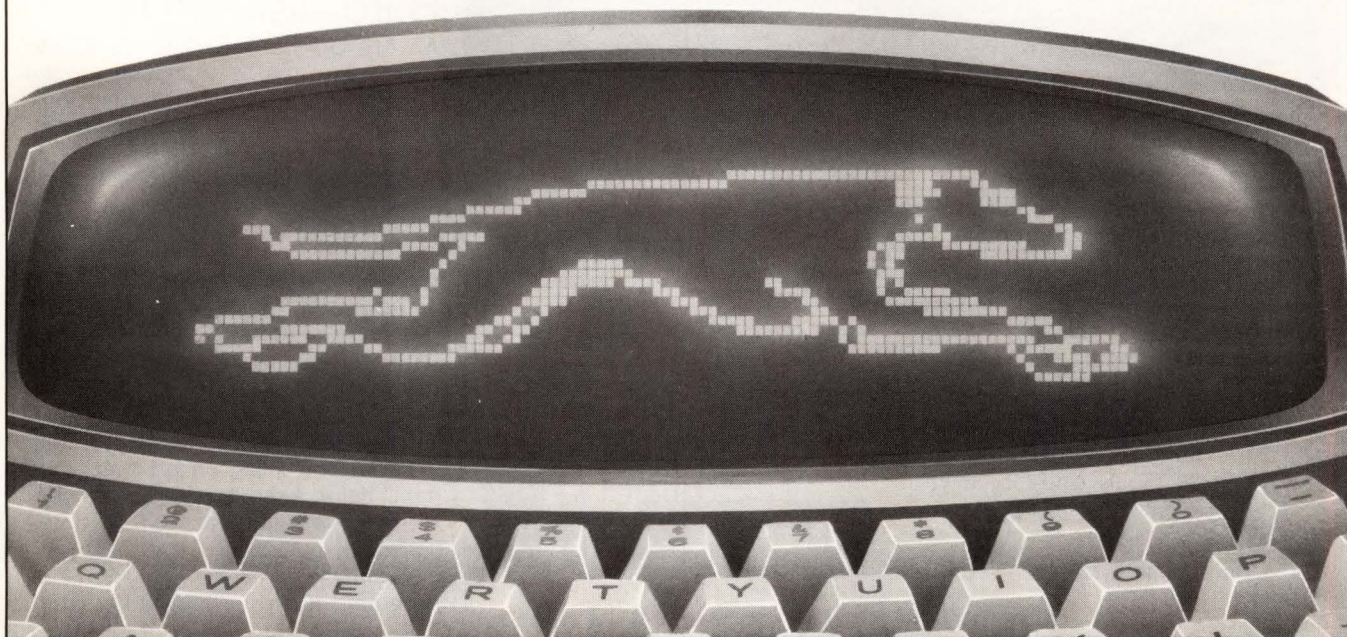
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Two 5 $\frac{1}{4}$ -inch Winchester disk subsystems for the IBM Personal Computer and compatibles provide 18 or 30 Mbytes of formatted data storage. Each subsystem includes a disk drive, power supply, and fan housed in a cabinet; a single-board controller can be installed without adjustments in the PC processor. Storagemaster model 518 drive, the equivalent of 56 floppy diskettes, costs \$2,595. Model 530, the equivalent of 93 diskettes, is \$3,390. Model 301 controller is \$599.

Control Data Corp., 8100 34th Ave. S., Bloomington, MN 55420.
(612) 853-8100. **CIRCLE 212**

Tri-featured unit

Tri-Writer is a letter-quality daisywheel printer, portable-computer terminal, and full-featured intelligent electronic typewriter all in one. The 18-pound system costs \$870. The printer has optional 8-Kbyte buffer

memory; the terminal can be plugged into a telephone modem; and the typewriter has several sophisticated features, such as automatic decimal tabbing, center, boldface, underlining, auto-erase, keyboard buffer, variable pitch, phrase memory, and code commands.

Q.M.T., 16130 Valerio St., Van Nuys, CA 91406.
(213) 994-0856. **CIRCLE 213**

Database for PC

Alphabase V, for the IBM Personal Computer and compatibles, as well as the TI Professional Computer, is a relational database program with a flexible report writer. It offers user-designed input screens and full-screen editing. The \$425 package can link up to four files when generating a report or entering data, can reconfigure a database at any time, and can create keyboard macros. It can also be integrated with most popular word-processing, spreadsheet, and database programs.

With the report writer, users "paint" reports on the screen.

Alpha Software Corp., 30 B St., Burlington, MA 01803.
(617) 229-2924. **CIRCLE 214**

Pro enhancements

New operating systems, tool kits, applications packages, and other enhancements are available for the DEC Professional 300 Series. The P/OS Hard Disk Version 1.7 operating-system license is included in the system price; media and documentation are \$175. Media and documentation for the RT-11 V5.1 system designed for the PDP-11 are \$700 for a single user. Bell Laboratories' Unix single-user license, media, and documentation are \$695. UCSD p-Systems are \$600 and \$975. Professional tool kits range from \$295 to \$495 for the Pro 350 and are \$4,000 for the VAX/VMS or RSX-11M/M Plus System. An Applications Starter Kit with four basic computing tools costs \$399. Some of the other packages available are Datatrieve interactive data-management system for \$495, UMD integrated development system for \$1,000 to \$3,000, Mechanical Engineering TK! Solverpack for \$100 to \$299, and Maps/Pro business graphics for \$200.

Digital Equipment Corp., Maynard, MA 01754.
(617) 897-5111. **CIRCLE 215**

Hard disk for TI

An MS-DOS-compatible 10-Mbyte Winchester disk is an option for the Texas Instruments Professional Computer. Price: \$2,295. The 5-Mbyte disk has been reduced to \$1,795.

Texas Instruments Inc., P.O. Box 402430, Dallas, TX 75240.
(1-800) 527-3500. **CIRCLE 216**

HP emulation with PC: PC 2622 software from Walker Richer & Quinn (Seattle) lets the IBM PC or any compatible work and look like intelligent HP 2622A terminals. **CIRCLE 217**

Spare-parts management: Probe-III, a package running on a stand-alone mini, helps keep spare-parts inventories to a minimum. It also helps schedule repairs, prioritize emergencies, and plan preventive-maintenance programs. It's from Omni of Wheaton, IL. **CIRCLE 218**

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OFFICE EQUIPMENT

For IBM S/34 or /36

A complete turnkey word processor is available for the IBM System 34 or 36. It features a 55-cps letter-quality daisywheel printer and financial/statistical wp software. Price: \$4,295. Word processor alone is \$750 and the printer is \$3,995. With the Triple Bin Sheet Feeder, letterheads, second sheets, and envelopes are automatically fed, printed, or collated in any order. It can be attached to plug-compatible printers for the S/34, /36, /38, or Personal Computer. Price: \$1,995.

Ampak Business Systems, 2640 Walnut, Tustin, CA 92680.

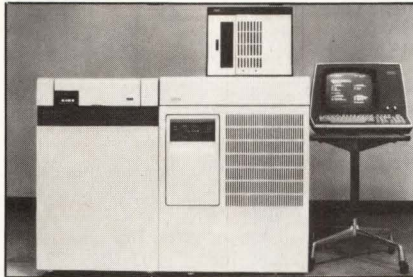
(714) 731-4217.

CIRCLE 233

Small 32-bit mini

Wang's VS 85 is a 32-bit minicomputer compact enough to fit small to medium-sized offices. It can be configured with up to 48 Mbytes of main memory, 32 workstations, and 2.5 Gbytes of mass storage. Optional

32-Kbyte cache memory expands the system to support up to 48 workstations with 5 Gbytes of system storage. The VS 85 is compatible with all the Wang VS peripherals and software as well as the Wangnet local-area net-



work. Basic system is \$63,000. Packaged systems with various disk-storage devices start at \$78,000.

Wang Laboratories Inc., One Industrial Ave., Lowell, MA 01851.

(617) 459-5000.

CIRCLE 234

Iris office system

The first release of the Point 4 Electronic Office System, which runs on the Iris operating system, consists of

word processing, electronic mail, and electronic calendar. Price is \$2,000. Future versions will also include graphics, notepad, and electronic files. **Point 4 Data Corp.**, 2569 McCabe Way, Irvine, CA 92714. (714) 863-1111.

CIRCLE 235

Digital dictation

The Lanier System IV dictation system uses a phone or Lanier input station to convert voice messages to digital impulses, which are then stored on a hard magnetic disk. They can be recovered for transcription instantly by direct random access, without scanning. Instructions can be changed anywhere in the voice text, and any position within a document can be located without rewinding or using fast forward. The pace can be slowed for transcription without causing voice distortion. Security codes are also built into the \$90,000 system.

Lanier Business Products Inc., 1700 Chantilly Dr. N.E., Atlanta, GA 30324. (404) 329-8000.

CIRCLE 236



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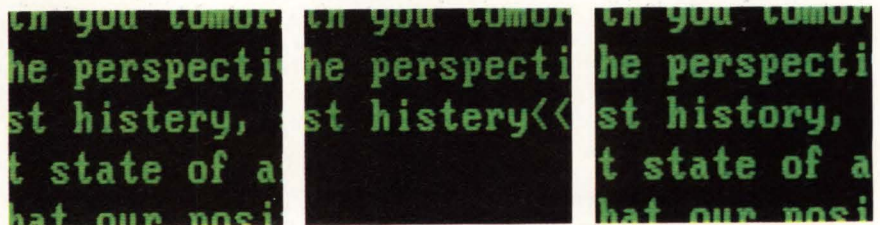
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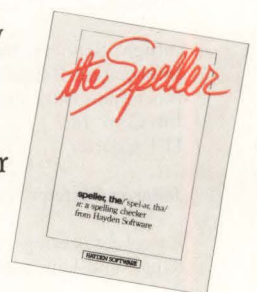
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*Runs on the Apple II, II+, IIe, the IBM PC and compatibles.

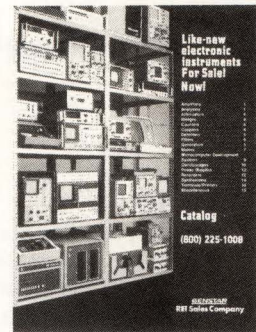
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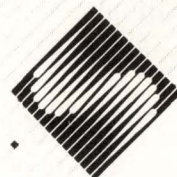
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OFFICE EQUIPMENT

Document system

Offix, software for the IBM Personal Computer, integrates electronic-filing functions, word processing, form design, and report generation. It requires an IBM-compatible MS-DOS operating system. Operators are guided by pictorial displays, which do not require graphics hardware. Users can create fields, records, and data files by following office procedures rather than computer procedures. There are three tiers of online user assistance. Price: \$99.

Emerging Technology Consultants Inc., 2031 Broadway, Boulder, CO 80302.

(303) 447-9495.

CIRCLE 201

LED typesetter and disk converter

The Digitek phototypesetter is an output device for word processors and personal computers. Using light-emitting diodes and fiberoptics, it pro-



duces 160 lines per minute with resolution up to 1,333 lines per inch. The ergonomic workstation fits on a desk. Price: \$16,995. When used with the desk-top Converter, the Digitek can accept keystrokes from virtually any word processor or personal computer. This media translator permits over 50 different word processors and personal computers to become diskette-compatible. Users can key material on one system, store it on a diskette, load the diskettes into the Converter, select the desired model for the translation, and load the translation program. Price: \$12,900 for six translation programs, \$15,900 with all the programs.

Itek Composition Systems, 34 Cellu Dr., Nashua, NH 03063.
(603) 889-1400.

CIRCLE 202

Wang wp option

WP Plus is an integrated word-processing editor for the Wang OIS, VS, and Alliance office systems. It offers integrated text and graphics, split-screen and multicolumn editing, an "undo" feature, foreign-language support, 8,000-page document capacity, spelling verification, online training, and other features. License fee is \$2,000.

Wang Laboratories Inc., One Industrial Ave., Lowell, MA 01851.

(617) 459-5000.

CIRCLE 203

Barcode printer: The GBT 5210BL Barcode/Label Printer, for the IBM System/34, /36, and /38, prints 21 barcode formats along with OCR-A, OCR-B, or standard alphanumeric annotation. It's made by General Business Technology of Tustin, CA.

CIRCLE 204

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CIRCLE 120

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University Club

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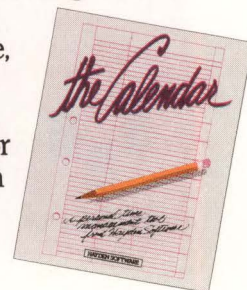
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*Runs on the Apple II, II+, IIe, the IBM PC and compatibles.

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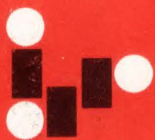
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CIRCLE 122

SOFTWARE

MVS sort program

Release 6.0 of IBM's DFSort for MVS and MVS/XA processes data 14 percent to 40 percent faster than earlier versions. Records not pertinent to the application are excluded before the sort process begins, and users can compress individual records to increase sort speeds. License charge is \$231 per month.

IBM (Contact local sales office.)

CIRCLE 220

Central database

The Netman data center and data-communications management system for VM/CMS uses a single server machine for an unlimited number of users to access and update a database simultaneously. With this centralized, integrated database, users can perform inventory control, configuration management, problem reporting, financial management, budget preparation, and change management. Introductory license fee: \$32,500.

California Software Inc., 1460 Fourth St., Santa Monica, CA 90401.

(213) 451-5693.

CIRCLE 221

Modeling for DEC

The Mentor online data-analysis and modeling package for the VAX-11, DECsystem-10, and DECsystem-20 uses literal names in addition to numerical row and column access. License fee: \$5,000. It can perform a consolidation on multiple models that use the same name identifiers. It also has a flexible interactive report writer and can store instructions for future use.

Interactive Systems Inc., 131 Middlesex Tpk., Burlington, MA 01803.

(617) 273-4420.

CIRCLE 222

Documentor for HP

MAD, the Multi-lingual Automatic Documentor for the HP-3000, provides documentation of programs written in Fortran, Cobol, and Basic, so separate documentors are not needed. The menu-driven system allows complete or partial documentation and delivers program listings, flowcharts, and a cross-referenced list of variables indicating where alterations will affect subsequent program operation. Price: \$4,995.

Related Computer Technology, 154 S. Main St., Keller, TX 76248.

(817) 379-5565.

CIRCLE 223

S/38 referencing

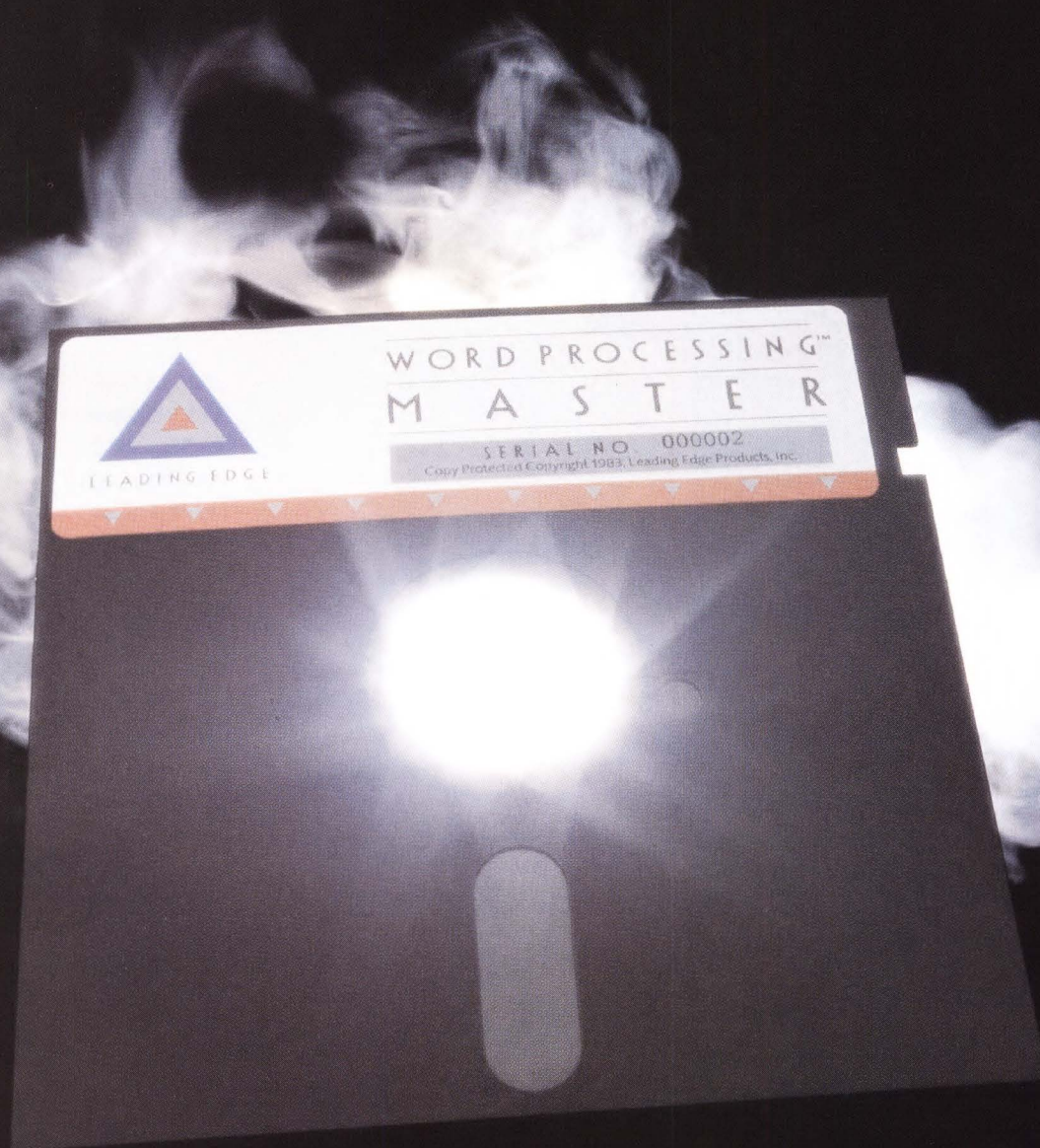
Probe is an interactive analysis and cross-referencing system for the IBM System/38. It displays job-stream explosions, shows control transfers from one program to another, provides flowcharts, and does field analysis. One-time license fee: \$1,000. It's \$350 for users of the Abstract/38 documentation system. Both systems may be licensed for \$1,350.

Advanced Systems Concepts Inc., 1084 Cornell, Wheeling, IL 60090.

(312) 920-1668.

CIRCLE 224

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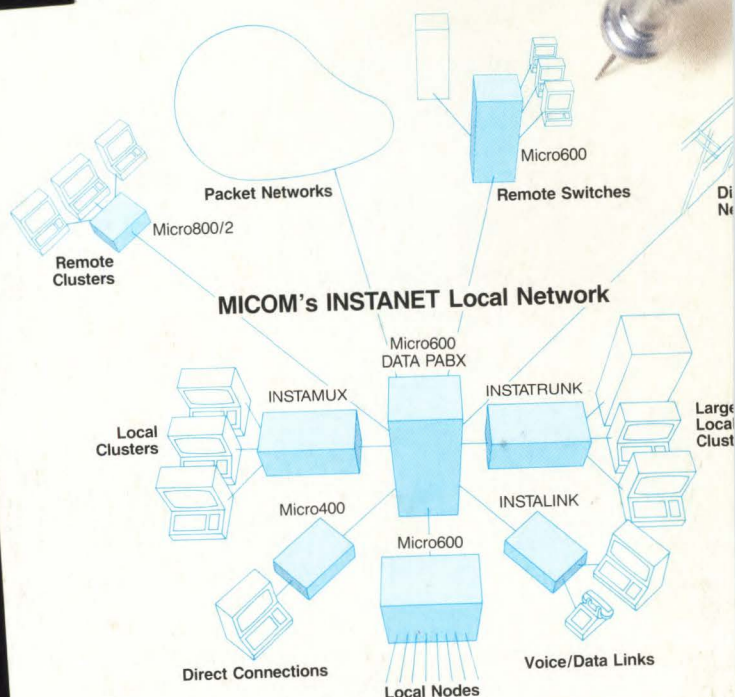
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